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ABDOMINAL PAIN

ITS CAUSES AND CLINICAL
SIGNIFICANCE

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BY

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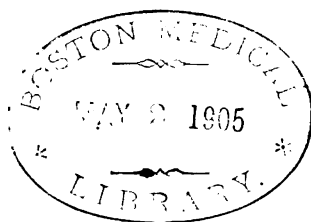
PREFACE

NONE can be more conscious of the imperfect results of his efforts than he who seeks to solve the mysteries of pain. An abstract quantity, it allows of neither visual observation, tactile perception, nor physical measurement. It, therefore, admits of none of those tests which it is possible to apply to nearly every other symptom of disease. Our estimate of it can only be formed by what we feel ourselves, and what we vaguely assume must be felt by others.

If I ventured to suggest the way in which I would hope this small work might prove of service to the busy practitioner in the differential diagnosis of obscure abdominal disease, it would be that, when confronted with pains the significance of which he cannot clearly construe, he should first turn to the chapters on the regional manifestation of pain, and seek among the causes there given the possible organ affected. With this as a workable basis he should next turn to those chapters which contain a fuller description of the symptoms exhibited by the disease of the particular organ under suspicion. But the search should not end here. It should lead to a proper perusal of the whole

subject as contained in such works as deal exhaustively with the disease the possible existence of which is in question. And yet I would ask that the earlier part of the book, dealing with the general cause and explanation of abdominal pain, be not omitted. A careful perusal of this section will open up lines for thought and consideration which may subsequently lead to the elucidation of much that still remains obscure.

Let me add that possibly the weakest part of my effort, and yet the very part that I had, at first, hoped to render the most complete, is that which deals with the regional manifestation of pain and the tabulation of its probable causes. It soon became clear to me, that it was practically impossible for one, whose domain of labour lay so largely in the department of general surgery, to exhaustively collect or efficiently describe the very varied characters of pain presented by the many diseases that rarely, and often never, came under his observation. Omissions, therefore, I know there must be. But if the whole circumstances of the case are properly borne in mind, the diagnostician will make all due allowance, and not pin his undivided faith to a belief that would make human nature a thing of human construction, capable of finite dissection and exhaustive treatment.

I had no intention of introducing the subject of treatment, but as so much has been gleaned from abdominal surgery in recent years, I did not think it would be out of place to conclude with a chapter or two on the performance of laparotomy. This led me to add, as an almost necessary sequel, a

few personal results obtained in the execution of
certain classes of abdominal operations ; and in this
connection I would express my indebtedness to Dr.
David Lamb, the Anæsthetist to the Victoria In-
firmary, whose services, both in my hospital and
private work, have so often relieved me of all
anxiety in the performance of a difficult operation.
To my old friend and first assistant, and now my
colleague, Mr. James Grant Andrew, Assistant-
Surgeon to the Infirmary, whose unfailing and
valuable help has extended over a period of fourteen
years, I am placed under a lasting sense of obliga-
tion and gratitude.

In conclusion, I have to acknowledge my in-
debtedness to Messrs. J. and A. Churchill for the
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ABDOMINAL PAIN

CHAPTER I

INTRODUCTORY.

THE clinical significance of abdominal pain has possibly never occupied a position of greater symptomatic importance than it does at the present day. We have come to regard pain as something more than the mere manifestation of a functional derangement. The old idea of a " stomach-ache," with the conventional administration of an aperient to clear out the canal or a sedative to soothe the patient's suffering, has given place to the more watchful and investigative attitude of seeking to ascertain the cause of the " ache." We now seek to differentiate between the localities of pain and the degrees of severity, looking at the same time as minutely as we can into the possible cause of its origin. The old term " colic " has, like that of " rheumatic," served in the past to cover a multitude of ill-defined and misunderstood complaints ; but its use is now becoming more and more restricted to special conditions. We speak of renal colic, biliary colic, appendicular colic, meaning thereby well-understood manifestations of definite and distinct diseases.

Pain, we know, has always been a symptom

A

which has found its place and received due con-
sideration in the description of most diseases in
which it is known to occur ; but it is only within
recent years that its true significance has come
to be rightly appreciated, and those differentiations
effected which have thrown so much light on the
nature and cause of intra-abdominal disease.   Until
the abdomen was opened and its contents freely
examined, it was not possible to know in many
instances the exact relationship borne between the
pain manifested and the disease which had given
rise to it.

For these reasons, therefore, it is that I have
ventured to discuss at some length a single symptom
such as that of pain.   And while it is only a symp-
tom, it bulks so largely in the differential diagnosis of
intra-abdominal disease that it seems to me to merit
a consideration above, and apart from, those other
symptoms in combination with which it constitutes
the usual description attached to any particular
disease.

But, apart from the question of pain as associated
sometimes with other symptoms in themselves
probably more distinctive, there is that in pain
which often gives it a significance peculiarly its
own.   For instance, there are cases where pain
is the first symptom, and only symptom ; and our
acumen as diagnosticians is often here best tested
in the early discovery and right appreciation of its
meaning.   And it is in this particular sense that
abdominal surgery has thrown so much light, and
been of such invaluable service in the importance
it has been permitted to attach to these earliest

manifestations of disease. Until it was shown that the abdomen could be opened and explored with practically absolute immunity, it was considered quite unjustifiable to execute such measures until, coupled with the pain, there were other manifestations sufficiently grave and obvious to warrant the investigation.

If I ventured another reason for imputing such importance to the one solitary symptom of pain, it would be that in discussing it on its own merits I am approaching it from the aspect in which it is most practically presented to the diagnostician. We may know perfectly well the symptoms of a particular disease, but it is quite another matter when we are face to face with our patient from whose symptoms we have to discover the disease. The candidate for his qualifying degree would possess the knowledge of the one ; but it requires the experience of practice to solve the other. It is, therefore, with the hope that in presenting the subject from this predominating aspect I may be permitted, as one who has now seen many years of abdominal surgery, to help to a better knowledge and appreciation of the subject those whose valuable life-work lies in the extensive field of general practice, and to whose lot it so frequently happens to come into first contact with disease in its initial stages and earliest manifestations. I echo the sentiment of every surgeon whose path of labour has traversed to any extent the extensive and intricate field of abdominal surgery when I say, how often we are compelled to operate when simple alleviation can alone result where earlier intervention

might have effected a cure ; and when, still worse, death must almost inevitably ensue, where life might have been saved. It is, therefore, with the hope that this humble effort to attach due importance to the symptom of abdominal pain that I offer this small work to the general practitioner ; and trust that in it he may find just reason for regarding the recurrence of pain within the abdomen as a symptom not to be lightly passed over, but to be considered and weighed with all due gravity, and with every determination in his power to discover its true cause and significance.

CHAPTER II

No proper appreciation of the symptomatic signifi-
cance of pain is possible without the most minute
and searching investigation into the nerve-supply
of those organs liable to disease. This consideration
mostly concerns the seat of the pain ; its quality in
part, and in some degree its severity, turn upon
other factors it is frequently neither possible to
discover nor easy to explain. Thus, there is no
doubt the greatest possible difference in the way
in which pain is borne by different individuals.
These differences may depend, on the one hand,
upon an unduly susceptible receptive central nervous
system, or, on the other, upon the character of the
nerve-endings, the nerve trunks and the tissues
around them, which may be too acutely sensitive
to peripheral stimulation. With this particular
side of the question it is not proposed to deal
at any length, but the careful diagnostician must
always allow considerations of this kind to have
their due place in weighing the relative sufferings of
his patients.

What we have chiefly to do with at present is

the locality of pain ; its peculiar severity becomes
an after-consideration. The practical point at issue
is, in the first place, to discover, from pain in any
particular region or spot, what is the likely disease
or derangement which has caused it. I say, there-
fore, to properly answer this question, we must
know as accurately as is possible the distribution of
all nerves directly and indirectly connected with
every structure the disease of which is likely to
give the symptom of pain.

The importance of this knowledge will soon
become manifest when we discover that pain at
one place may indicate disease at another. It is,
no doubt, from want of knowledge of this kind
that so many mistakes in diagnosis are made in
practice. I well remember how in one case some
few years ago I was caught in this way. Summoned
to a supposed case of perforation, I too readily
accepted the proffered diagnosis, only to learn
later that the case was one of pleuro-pneumonia,
and not abdominal disease. It is true that, as
time progresses and our clinical experience increases,
we are apt to forget much of our minuter anatomy ;
but this somewhat superficial way of acquiring our
knowledge is, I venture to think, neither so safe
nor so certain as that which is based on the rational
foundations of anatomy. If we are properly alive
to the various nerve ramifications and distributions,
we are much more likely to avoid the pitfalls that
await us when we encounter some obscure condition
that does not quite fit into our clinical experience.
I emphasise, therefore, these remarks, as I feel that
by so doing I am directing along those lines which

will best ensure our learning to make earlier and
more accurate diagnoses ; and even, it may be, to
elicit facts which are still unknown to us.

In dealing, then, with nerve distribution, I
propose to consider, firstly (*a*), *the supply of the ab-
dominal parietes ;* secondly (*b*), *the main trunks
which enter the abdominal cavity*, and their connec-
tion with the other large distributing centres ; and
thirdly (*c*), *the nerve-supply of each individual organ*
with its various connections.

A. THE NERVE-SUPPLY OF THE ABDOMINAL PARIETES.

A reference to Fig. 1 will indicate the nerve-
supply of the anterior and lateral walls of the
abdomen.   Here it will be seen that the greater
part of both front and sides are supplied by the
lower five or six intercostals.   The trunks, which
are the anterior primary divisions of the dorsal
spinal nerves, give off about midway between the
spines posteriorly and the linea alba anteriorly,
lateral branches, which themselves again divide
to form secondary anterior and posterior branches.
The intercostals themselves finally terminate in
perforating the rectus muscle on each side, and so
give a sensory supply to nearly the entire median
portion of the abdomen in front.   Towards the
hypogastric region and the lateral flanks, the last
dorsal nerve and portions of the ilio-hypogastric
and ilio-inguinal nerves make their appearance.
The iliac branches of the last two nerves pass over
the crest of the ilium about two to two and a half

inches from the anterior superior spine and continue to be distributed to the upper part of the buttock. The supply of the parts about an inch above the
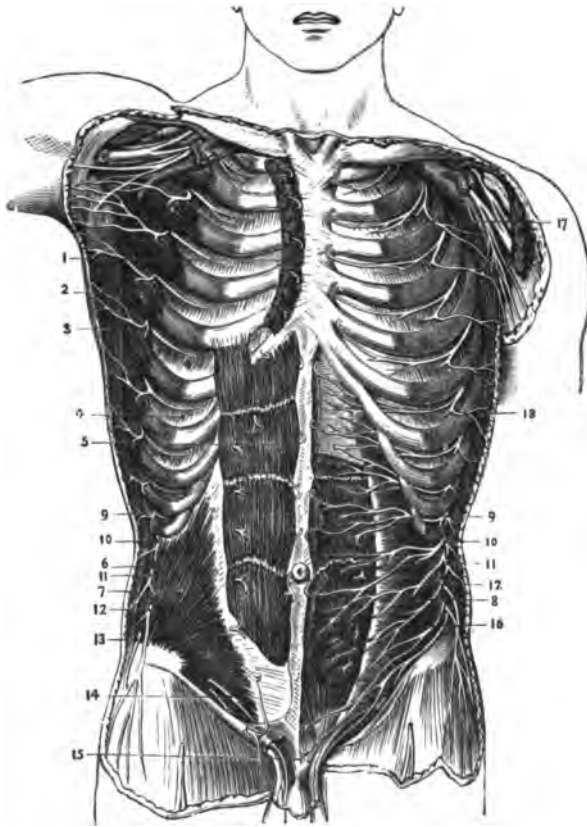
Fig. 1.—The nerves of the abdominal wall.

1. Pectoralis major (cut). 2. Serratus magnus. 3. Latissimus dorsi. 4. Intercostal muscles. 5. Rectus abdominis. 6. Section of obliquus externus. 7. Obliquus internus. 8. Transversalis abdominis. 9, 9. Ninth dorsal nerve. 10, 10. Tenth dorsal nerve. 11, 11. Eleventh dorsal nerve. 12, 12. Twelfth dorsal nerve. 13. Iliac branch of ilio-hypogastric. 14. Hypogastric branch of ilio-hypogastric. 15. Inguinal branch of ilio-inguinal. 16. Ilio-hypogastric and ilio-inguinal nerves. 17. Intercosto-humeral nerve. 18. Lateral cutaneous branch of intercostal nerve.

pubes, it should be noted, is by the hypogastric branch of the ilio-hypogastric.

The posterior wall of the abdomen is interesting, from the fact that its nerve-supply is from the lumbar and sacral spinal nerves, and not the dorsal.
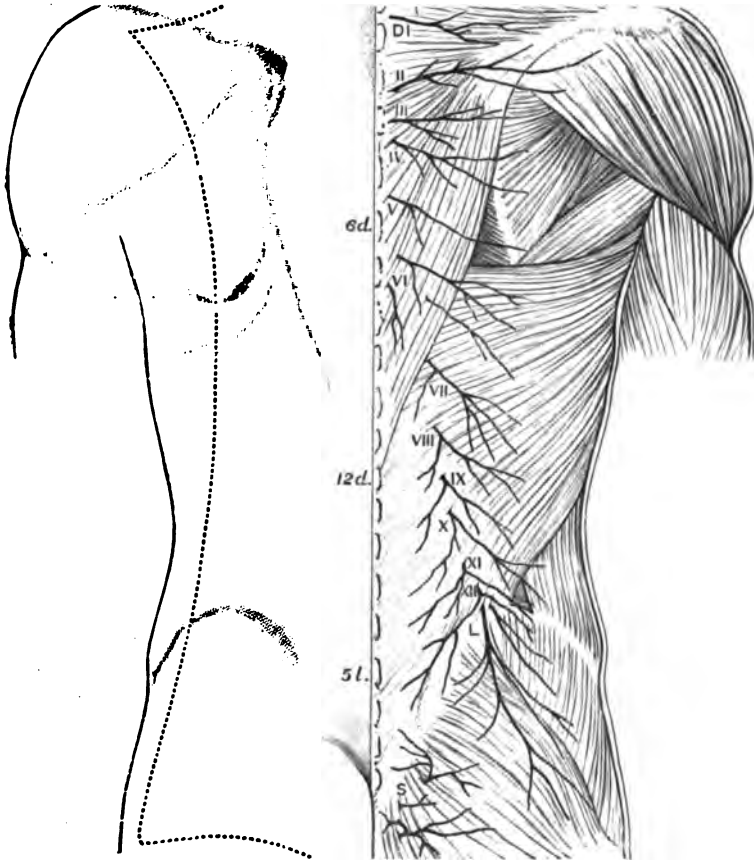
FIG. 2.—Cutaneous distribution of the posterior primary branches of the dorsal and lumbar spinal nerves. (From Quain after Thane.)

6 d. Sixth dorsal spine. 12 d. Twelfth dorsal. 5 l. Fifth lumbar. The nerves are indicated as follows: D I., first dorsal; II to XII, second to twelfth dorsal; three cutaneous branches are given by the sixth dorsal, two from the internal, and one from the external division; L, lumbar; S, upper sacral.

The median portion of the posterior abdominal parietes is formed by the five lumbar vertebræ

and the sacrum, and it is from the posterior branches
of those trunks whose anterior divisions go to form
the lumbar and sacral plexuses that the nerve-
supply of this particular region is derived (*see*
Fig. 2).

If we now look a little more closely into the origin
of those nerves whose distribution we have just
traced, we shall see how they possess certain deeper
connections that at once suggest the importance
which may subsequently
become attached to them.
Look first at Fig. 7. Here
it will be seen how the
intercostal, the lumbar,
and the sacral nerves are
connected with the chain
of ganglia that exist on the
main sympathetic trunks
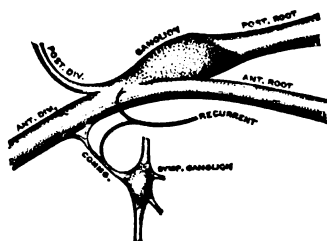
Fig. 3.—Plan of the mode of branching
of a segmental nerve. (After Quain.)

coursing downwards on each side of the spinal
column. This connection is better seen by a refer-
ence to Fig. 3; a small communicating branch
passes from the ganglion to the anterior division.

The *lumbar plexus*, which lies on the posterior wall
of the abdomen, is important for our purpose, in-
asmuch as from it course certain cutaneous branches
already referred to. Thus, it will be noticed, by
looking at Fig. 4, that, coming from the first lumbar
nerve and receiving a branch from the last dorsal,
is the *ilio-hypogastric*. Immediately below this is the
ilio-inguinal, also derived from the first lumbar,
with sometimes an accessory branch from the dorso-
lumbar cord. Coursing somewhat in the same
direction, only lower down, on the abdominal wall,

is the *external cutaneous*, taking its origin from the second and third lumbar nerves; while not directly concerned, like the preceding nerves, in the cutaneous supply of the abdominal parietes, its distribution on the outerside of the thigh should
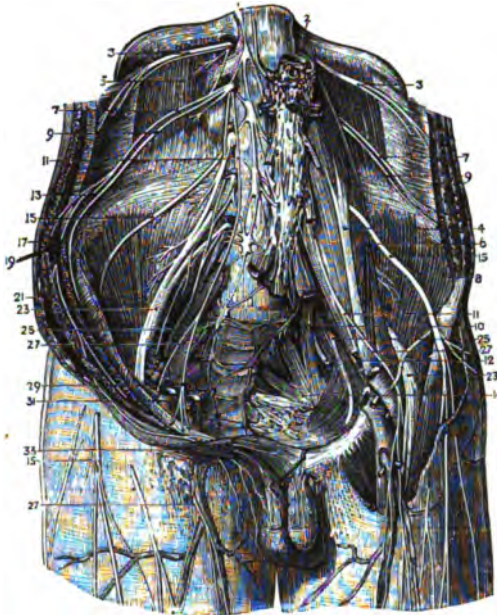
FIG. 4.—Lumbar plexus.

1. Right gangliated cord of sympathetic. 2. Abdominal aorta. 3, 3. Last dorsal nerves. 4. Psoas parvus. 5. Quadratus lumborum. 6. Psoas magnus. 7, 7. Ilio-hypogastric nerves. 8. Iliacus internus. 9, 9. Ilio-inguinal nerve. 10. Lumbo-sacral nerve. 11, 11. Genito-crural nerves. 12. Gluteal nerve. 13. Iliac branch of ilio-hypogastric nerve. 14. Sacral plexus. 15, 15, 15. External cutaneous nerves. 17. Transversalis abdominis. 19. Obliquus internus. 21. Obliquus externus. 23, 23. Anterior crural nerves. 25, 25. Obturator nerves. 27, 27. Crural branch of genito-crural nerve. 29. Genital branch of genito-crural nerve. 31. External iliac artery. 33. External abdominal ring.

be remembered, as explaining certain obscure conditions of referred pain.   The *genito-crural*, which lies somewhat more in the median line posteriorly, courses along the brim of the pelvis to end in its

genital branch which supplies the scrotum, and its
crural branch which supplies the skin on the upper
part of the thigh. It is derived from the second
lumbar nerve, but receives also a few fibres from
the connecting cord between that and the first
nerve.

The *obturator nerve*, which comes from the second,
third, and fourth lumbar nerves, is mostly a muscle-
nerve, but it occasionally gives a cutaneous branch
to the inner side of the thigh and to the inner and
upper part of the leg.

The *anterior crural*, derived principally from the
third and fourth lumbar nerves, in part also from
the second and first, is distributed to the skin upon
the forepart and inner side of the thigh, and also
to the inner side of the leg and foot.

The *sacral plexus* (*see* Fig. 5), lying on the pos-
terior wall of the pelvic cavity or lower abdomen,
distributes its cutaneous branches mostly to the
external genitals, perineum, and legs. It is formed
by the lumbo-sacral cord (itself the result of a
junction between the fifth and part of the fourth
lumbar nerves), the anterior divisions of the first
three sacral nerves, and part of the fourth. The
branches for cutaneous distribution are the follow-
ing: The *small sciatic*, which arises from the upper
three sacral nerves, passes out of the pelvic cavity
in conjunction with the great sciatic. It distributes
cutaneous branches to the skin over the lower part
of the buttock, the back of the thigh, and the upper
part of the back of the leg. The *inferior pudendal*
branch of the nerve turns inwards below the ischial
tuberosity and supplies the skin on the upper and

inner aspect of the thigh, and continuing forwards and upwards, ends in the skin on the outer side of the scrotum or external labium.

The *perforating cutaneous* nerve is a small branch
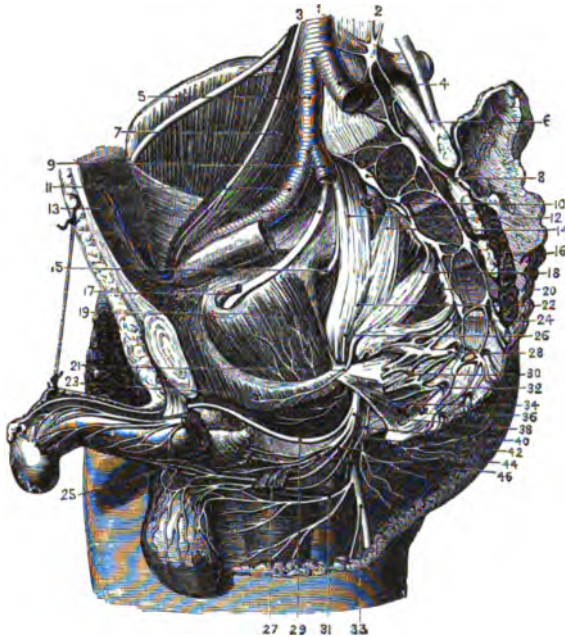
FIG. 5.—Side view of the nerves of the pelvis, the viscera having been removed.

1. Abdominal aorta.   2. Gangliated cord of sympathetic (left side).   3. Genito-crural nerve.   4. Left common iliac artery.   5. Right common iliac artery.   6. Left lumbo-sacral cord.   7. Psoas muscle.   8. Gangliated cord of sympathetic (right side). 9. Internal iliac artery (cut).   10. Gluteal artery (cut).   11. Right external iliac artery.   12. Right lumbo-sacral nerve.   13. Obturator nerve.   14. First sacral nerve. 15. Gluteal nerve.   16. Pyriformis of left side (cut).   17. Obturator artery.   18. Second sacral nerve.   19. Obturator internus.   20. Pyriformis of right side.   21. Nerve to levator ani.   22. Sacral plexus.   23. Levator ani (cut).   24. Third sacral nerve. 25. Bulb of urethra covered by accelerator urinæ.   26. Nerve to obturator internus. 27. Transversus perinæi (cut).   28. Fourth sacral nerve.   29. Dorsal nerve of penis. 30. Visceral branches (cut).   31. Inferior pudendal nerve.   32. Fifth sacral nerve. 33. Small sciatic nerve.   34. Coccygeus muscle.   36. Sixth or coccygeal nerve. 38. Internal pudic nerve.   40. Inferior hæmorrhoidal nerve.   42. Posterior superficial perineal nerve.   44. Anterior superficial perineal nerve.   46. Deep perineal nerves to bulb and muscles.

which arises usually from the second and third sacral nerves, and passing through the great sacro-

sciatic ligament terminates by distributing fibres to the skin over the inner and lower part of the gluteus maximus.

The *pudic nerve* (*see* Fig. 6) is derived principally from the third sacral nerve, but is also enforced by branches from the second and fourth, and possibly in addition from the first. By means of its three terminal portions—the inferior hæmorrhoidal, the
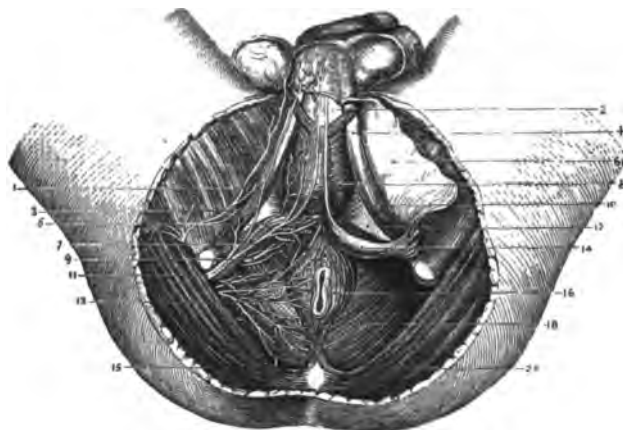
Fig. 6.—Superficial dissection of male perineum. (Drawn by J. T. Gray.)

1. Inferior pudendal nerve. 2. Urethra. 3. External or posterior superficial peri-neal nerve. 4. Crus penis. 5. Superficial perineal artery. 6. Deep layer of super-ficial fascia reflected (Fascia of Colles). 7. Internal or anterior superficial perineal nerve. 8. Bulbo-cavernosus. 9. Muscular branches of pudic nerve. 10. Ischio-cavernosus. 11. Pudic artery and nerve. 12. Deep perineal fascia or triangular liga-ment. 13. Inferior hæmorrhoidal artery and nerve. 14. Reflection of the deep layer of superficial perineal fascia round transversus perinei. 15. Branch of fourth sacral nerve. 16. Sphincter ani. 18. Levator ani. 20. Gluteus maximus.

perineal and the dorsal nerve of the penis—it supplies the skin of the perineum, the posterior parts of the scrotum and the labia, and the penis and clitoris.

The *great sciatic nerve* is practically the continua-tion of the main part of the sacral plexus. It

supplies cutaneous branches to the skin on the outer side and front of the leg and dorsum of the foot.

The remaining spinal nerves, which exist at the lowest part posteriorly of the abdominal or pelvic cavity, are the greater part of the *fourth sacral*, the *fifth*, and the *coccygeal*.

That portion of the fourth sacral left after the distribution of a branch to the sacral plexus supplies certain visceral branches to the lower part of the bladder and to the vagina.   These branches become intimately mixed with the fibres of the sympathetic plexus, and will be more specifically referred to when describing this portion of the nervous system.

The anterior branch of the fifth sacral supplies the skin over the posterior and lateral parts of the coccyx.

The coccygeal joins with the fifth sacral, taking part in its area of distribution.

While it may be thought, and probably cannot be said, that the distribution of the lower branches of the lumbar and sacral plexuses has much to do with the subject of abdominal pain, nevertheless the peripheral cutaneous supply becomes of considerable interest and importance in the light of referred pain when associated with intra-abdominal or pelvic disease.   We are often enabled to acquire confirmatory evidence as to the possible nature, connection and position of any disease, which in itself may give manifestation of abdominal pain, by finding that a referred pain exists in the course of remotely distributed cutaneous fibres derived from the same source as that from which it is presumed the diseased region receives its supply.   While we are considering the

subject solely from the aspect of pain, and so concentrating our attention on the sensory and cutaneous supply of the spinal nerves, it is impossible not to feel that there is another element in the case, which, if carefully observed, might possess some feature of distinct diagnostic interest and value. Thus, we cannot but believe that when a stimulus is applied to a mixed motor and sensory nerve sufficient to cause pain, that the same grave stimulus must excite activity in the motor fibres as much as in the sensory; and that whatever be the muscle supplied by that nerve, it will be thrown into action, becoming tonically contracted, and so producing clinically a certain amount of stiffness. We have many good evidences of this; for instance, there is the rigid abdominal wall at the early stage of peritonitis, or the stiff joint in acute arthritis.

So that, while this aspect of the subject does not quite fall within the scope of the present discussion, it is well to remember that our knowledge of the nerve distribution of these great spinal plexuses cannot be too exact if we wish to realise to the fullest the value such knowledge may be in the correct diagnosis of disease.

B. The Main Nerve Trunks entering the Abdominal Cavity and their Connections with other large Distributing Centres.

The *pneumogastrics* enter the abdomen, one on each side of the œsophagus. In the thorax the two nerves, right and left, freely communicate, forming the œsophageal plexus. From this inter-

lacing they emerge as two cords. One, designated the right, which is a more or less direct continuation of the same nerve above, descends through the diaphragm along the back of the œsophagus. It becomes finely divided into branches, which spread out on the posterior surface of the stomach and enter the great solar plexus. The other, called the left, and similarly a more or less direct continuation of the same branch above, enters the abdomen in front of the gullet and is spread out on the anterior surface of the stomach. The further distribution of these nerves, as they more particularly affect the stomach, will be referred to when discussing the innervation of that organ.

The *sympathetic* enters the abdomen beneath the pillars of the diaphragm as two main trunks. At first each cord lies on the front of the lumbar vertebræ along the inner side of the psoas muscle, but as the cavity of the pelvis is entered the two cords approach each other somewhat more closely, until at the lowest part they become united in a loop, in which is a small ganglion called the *coccygeal ganglion*, or the *ganglion impar*.

As in the thoracic region, small ganglia are situated at intervals on the main trunks, and are usually about four in number in the lumbar region, and four in the sacral. These ganglia serve to form connecting links between the spinal nerves on the outer side and the various abdominal plexuses on the inner. Thus, it will be seen that each ganglion possesses two communicating branches (one containing medullated fibres and one non-medullated, sometimes united into one branch)

with the spinal nerves ; while on their inner side they distribute branches which pass to the middle line and help to form in the abdomen proper the aortic and hypogastric plexuses, and in the pelvis the pelvic plexuses (*see* Fig. 7).

Besides the two main trunks of the sympathetic, there are three other branches on each side which pass down from the thorax into the abdomen to form connections with some of the great central plexuses to be presently described. The nerves are known as the *splanchnics*—the great, small, and smallest.

The *great splanchnics*, one on each side, are made up of branches derived from the fifth or sixth to the ninth or tenth thoracic ganglia. They enter the abdomen by perforating the crus of the diaphragm and terminate respectively in the upper part of the right and left semilunar ganglia. A few fibres sometimes pass to the supra-renal bodies and the renal plexuses. Filaments are also given to the front of the vertebræ and the aorta.

The *small splanchnics*, also two in number, arise from the ninth and tenth (sometimes the tenth and eleventh) thoracic ganglia, and after entering the abdomen terminate in the lower part of the semilunar ganglia of their respective sides. These nerves communicate with the great splanchnics and some- times send branches to the renal plexuses.

The *smallest splanchnics* arise on each side from the last thoracic ganglia, and after passing with the main trunks of the sympathetic through the dia- phragm, enter the renal plexuses.

The *phrenics* cannot be said to be nerves which

FIG. 7.—Diagrammatic view of the abdominal sympathetic plexuses, with connecting branches from the spinal nerves and the sympathetic ganglia. (From Quain.)

D6. Sixth dorsal nerve. *d6.* Sixth dorsal sympathetic ganglion. *O.* Œsophageal plexus in long meshes on the gullet. *CO.* Right, or posterior, and *CO'* left, or anterior, coronary plexus. *pn'.* Right vagus. *pn''.* Left vagus. *sp.* Great splanchnic nerve. *SO.* Solar plexus. *+.* Small splanchnic. *++.* Smallest splanchnic. *rs.* Renal plexus. *ao.* Aortic plexus. *ms.* Superior mesenteric plexus. *mi.* Inferior mesenteric plexus. *hy.* Hypogastric plexus. *pl.* Right pelvic plexus. *cg.* Coccygeal ganglion. *D12.* Twelfth dorsal nerve. *l1.* First lumbar ganglion. *L3.* Third lumbar nerve. *S1.* First sacral nerve. *S3.* Third. *S5.* Fifth. *cr.* Anterior crural nerve. *cr'.* Great sciatic nerve. *ir.* Rectum. *v.* Bladder.

enter the abdominal cavity; but one or two filaments of the right nerve join in a ganglion situated in the diaphragm which has connections with the solar plexus, the supra-renal body, and the hepatic plexus. Communications take place also on each side with the phrenic plexuses.

THE ABDOMINAL SYMPATHETIC PLEXUSES.

Lying immediately upon the abdominal aorta is an intricate interlacing of nerve fibres. At two places this network is denser and mingled with ganglia. These more closely and finely mingled meshes of nerve fibres constitute respectively the great solar and hypogastric plexuses. The former is placed at the upper part of the abdomen in front of the aorta and pillars of the diaphragm. The latter lies in front of the body of the fifth lumbar vertebra.

The *solar plexus* embraces on each side the two large semilunar ganglia, and together they constitute the great centre of intercommunication between almost all the viscera within the abdomen and many parts without it. Thus, entering it from above are the two splanchnics of each side—the large and the small—and the right pneumogastric. Passing from it in almost all directions are branches which, by their subsequently interlacing, form the various plexuses that are to be found mostly accompanying the main branches of the abdominal aorta. Thus we have :

The *phrenic* or *diaphragmatic plexuses*.—These pass upwards with the arteries of the same name to the diaphragm, where they join with the phrenic nerves,

which, it will be remembered, are spinal nerves descending principally from the fourth cervical nerves.

The *supra-renal plexuses* are closely associated with the upper and outer parts of their respective semilunar ganglia. They connect on each side with the corresponding phrenic plexus and receive fibres from the great splanchnics.

The *renal plexuses* lie on the renal arteries, to the lower and outer side of the semilunar ganglia. They usually receive branches from all the splanchnics, from the first lumbar ganglion and from the aortic plexus, which lies below and to its inner side.

The *spermatic plexuses* might be described as derivatives of the renal, for most of their branches come from the lower part of those plexuses. They receive branches from the aortic plexus on the inner side, and in the course of their branches of distribution to the testes in the male and the ovaries and uterus in the female, they connect with other branches derived from the pelvic plexuses.

The *cœliac plexus* is derived from the front part of the solar plexus. It surrounds the artery of the same name and receives on its left side a considerable offset from the right vagus. From this plexus are derived three subsidiary ones, named after the branches of the cœliac artery, with all the terminal branches of which they become closely connected. Thus, the *coronary plexus* is placed along the small curvature of the stomach and communicates with branches from the vagi. The *hepatic plexus* is placed over and around the hepatic artery. It is joined by offsets from the left vagus ; and a connection also exists between it and the right supra-

renal plexus. Other small plexuses are to be found on the branches of the hepatic artery and are similarly named—the *pyloric, gastro-epiploic, pancreatico-duodenal,* and *cystic;* branches from these plexuses unite with others coming from the coronary, splenic, and mesenteric. The *splenic plexus* is found on the splenic artery. It receives filaments from the right vagus, and furnishes the *left gastro-epiploica* and *pancreatic plexuses,* branches from which course along the arteries of the same name.

The *superior mesenteric plexus* surrounds the trunk of the superior mesenteric artery, and is placed at the lower part of the solar plexus. It receives fibres from the right vagus, and from it are derived numerous subsidiary plexuses situated on the various branches of distribution of the main artery.

The *aortic plexus* rests upon the aorta between the superior and inferior mesenteric trunks. There are branches of communication between the plexus and the renal and spermatic plexuses already alluded to when describing these latter. Further, fibres interchange between the lumbar ganglia and the plexus. Below, the plexus freely communicates with the great hypogastric plexus, and through this, therefore, becomes indirectly associated with the pelvic plexuses and their derivatives.

The *inferior mesenteric plexus* is chiefly derived from the last, in front of and below which it is situated. The distribution of its branches are along the course of the inferior mesenteric artery, and in this way they are brought into communication with branches coming from the superior mesenteric and pelvic plexuses.

The *hypogastric plexus* bears somewhat the same relationship to the viscera of the pelvis that the solar plexus does to the viscera of the abdominal cavity proper. Situated on the body of the fifth lumbar vertebra, it lies in the interval between the two common iliac arteries. The dense mesh-work of this plexus is formed mostly out of the fibres which descend from the aortic plexus above.

The *pelvic plexuses*, two in number, are placed in the lower part of the pelvic cavity posteriorly, one on each side of the rectum in the male, and the vagina in the female. They are formed by branches descending from the hypogastric plexus above, by branches coming from the second, third, and fourth sacral nerves, and by a few small filaments from the sacral ganglia. From these plexuses the following nerves are given off : (1) *Hæmorrhoidal*, which pass to the lower part of the rectum and communicate with the superior hæmorrhoidal branches from the inferior mesenteric plexus. (2) *Vesical*, which go to the sides and lower parts of the bladder and ureters ; some of these go also to the vasa deferentia, where they communicate with branches descending from the spermatic plexuses ; and others are directed to the vesiculæ seminales. (3) *Prostatic*, which, in addition to supplying the prostate, continue forwards to supply, as cavernous nerves, the erectile tissue of the penis. (5) *Vaginal,* which go to supply the erectile tissue on the lower and anterior part. (6) *Uterine*. These branches, while coming from the lateral part of the pelvic plexus, are mostly derived from the hypogastric plexus. They pass between the layers of the broad ligament, where

they communicate with branches of the ovarian nerves (spermatic plexus) and proceed to supply mostly the neck and lower portion of the body of the uterus.

General Remarks upon the Nervous System of the Abdominal Cavity.

Before proceeding to describe the nerve-supply of the various contents of the abdominal cavity, it is worth while to consider briefly the probable economic importance of this peculiarly elaborate and intricate system of nerve distribution. In the first place, we can hardly believe, nor indeed have we any right to believe, that this extraordinary amount of interlacing of nerve fibres, so profusely scattered in all parts, is without some vital significance in the general economy ; nor is it possible to suppose that the minute fibres which come from more distant regions, connecting some with one plexus, some with another, have not equally an important function to subserve. There can be nothing accidental in these apparently insignificant, because so small, factors. So we must assume that all this minute interlacing and connecting of nerve fibres is playing some well-defined part in the normal functional activity of the body, and it becomes our duty to search out as much as we can what its possible meaning may be. The extreme sensitiveness of every nerve fibre to the transmission of its own peculiar force must render the activity of the whole system embraced in these plexuses and their connections one of prime importance,

and the only importance that strikes one as being the most likely, is that no influence of any moment can possibly take place at one spot or part without its effects being felt to a greater or less degree in all other places.   Instances of the truth of this are sufficiently familiar in the effect produced upon the heart by certain grave influences brought to bear upon the abdominal viscera.   But there must be innumerable instances of a far less distinctive character with which we are at present quite unfamiliar. We know that these varied nerve fibres are capable of transmitting every kind of nerve force.   Thus, some fibres may be transmitters of motor force, some sensory, some secretory, others vaso-motor ; and experimental physiology has been able in certain cases to map out some of these distinctive fibres.   In these complicated plexuses which have just been described, we probably have these fibres all commingled, and it is well-nigh impossible not to believe, that when any material disturbance is brought to bear upon a particular plexus through the undue stimulation of a part supplied by its nerves, that a much wider effect must be produced than would otherwise be the case if no such association existed.   With such considerations it is possible to see some explanation of the many varied phases which the same disease may present in different individuals.   Thus, in one case the stimulus may be more effective on the fibres of the sensory class than on the secretory ; on the motor than on the vaso-motor.   Indeed, thoughts of this kind open up a very vast field for investigation, and if pursued would take us away from the limited considerations

which we have in view. But one cannot help feeling that, just as we are seeking by these various nerve-interlacings to explain the symptom of pain, so we might with just as much reason also take up the possible manifestations which may equally exist of definite and distinctive disturbances in the vaso-motor, motor, or secretory systems. Perhaps the future has yet in store for us many useful revelations in this respect ; and from the recent light that has been thrown upon the secretion of the pancreas in disease, we may reasonably hope that, added to the symptom of pain, we may have many others equally clear that will lead to the better diagnosis and differentiation of disease.

I cannot conclude these few remarks better than by giving a few clinical facts which seem to support the truth of what I have just ventured to surmise. The kidney appears to afford some of the best illustrations. Thus, it is well recognised that a movable kidney may give rise to gastro-intestinal disturbances ; and vomiting, which is so frequently associated with renal colic, is probably to be explained more on the basis of a reflex nerve stimulus than as simply the result of pain. A similar theory holds good with regard to biliary colic. A somewhat interesting, and apparently rare reflex, was exhibited in a case recorded by Dr. David Newman before one of the societies. In this instance, the patient suffered from a right movable kidney. She was occasionally seized with " suffocative attacks," and it was noted that so long as the patient remained at rest there were no attacks ; but on moving about they recurred. In this case also

there were marked gastro-intestinal disturbances
which equally seemed to be intimately associated
with any displacement of the kidney.

The following case is one of peculiar interest in
this connection. The reflected nerve influences
appear to have been through the motor channels
of the plexuses, although these again seem only to
have become manifest by referred pains. A medical
man being himself the patient, the record which he
gives of his own case possesses a value over and
above that which otherwise might be attached to
it. The cause of the symptom was a mulberry
calculus embedded in the substance of the kidney.
The doctor was kind enough to write me a very ·
full description of his sufferings ; and from this
report I have abstracted the particular points that
seem to bear upon the subject under discussion.
In the following words he describes what he con-
sidered a typical attack : " After, say, over-exertion
one day, I felt somewhat languid and restless during
the remainder of the day. At night no albumen
was found in the urine, and I expected to escape
the consequences of my indiscretion. However, on
going to bed I soon began to suffer from intes-
tinal colic, which prevented me from sleeping. The
pain was distinctly intestinal, and usually there
was some tenesmus. There might or might not be
some of the backache (which was sometimes felt
in the absence of all other symptoms). Never was
there renal colic as described in books or by patients,
nor was the pain in the back of a sharp, cutting
nature, but was aching or crushing in character—
except once, when travelling in a railway train, I felt

something like a stabbing pain. During the night the colic gradually passed off. Next morning the urine contained blood and considerable albumen. This happened so often that I came to know there would be hæmaturia in the morning if I had had any intestinal colic the night before." In another part of the report he describes this particular colic still more graphically: "After going to bed one night, at the end of a day during which I knew I had been exposed to a severe chill, I was seized with agonising pain in the bowels, seemingly irregular contractions of the muscles commencing high up in the small intestine and passing rhythmically downwards, involving coil after coil, extending into the colon and ending by causing some tenesmus— apparently then going to pass off, but recommencing in the small intestine and following the same course as before. A good deal of flatus was passed." It is impossible, I think, to read this account without conceiving that the irritation set up by the stone in the kidney caused a violent peristalsis of the whole intestinal tract, and that this was brought about by nerve stimulation through the intercommunicating fibres of the nerve plexuses.

CHAPTER III

C. THE NERVE-SUPPLY OF THE VISCERA AND OTHER PARTS WITHIN THE ABDOMEN.

THE *œsophagus.*—Only half an inch or so of the gullet lies within the abdominal cavity. It is supplied, like the rest of the canal, with branches from the two vagi, the left in front and the right behind. Branches of the coronary plexus, a derivative of the cœliac plexus, also supply this portion.

The *stomach.*—The nerve-supply of the stomach is derived from the two vagi, and from the cœliac plexus. The left vagus at the front part of the cardiac orifice divides into various branches which spread over the anterior surface of the viscus, others pass along the lesser curvature. While the chief source of the sympathetic supply is from the cœliac plexus, the nerve branches come directly from the subsidiary plexuses. Thus, the coronary plexus supplies the cardiac end of the lesser curvature; the pyloric, the pylorus; the gastro-epiploica dextra, the pyloric antrum and right part of the stomach; the left gastro-epiploic, from the splenic plexus, the left portion. The sensory fibres supplying the stomach are stated by Head to come from the sixth, seventh, eighth, and ninth dorsal spinal segments, the sixth and seventh supplying mostly the cardiac end, and the ninth the pylorus (*see* Figs. 8 to 11).

These various nerves form gangliated plexuses between the layers of the muscular coat and in the submucous coat. Their ultimate endings have not been traced.

The *duodenum*.—The first part of the duodenum is supplied from the hepatic plexus through its pyloric and gastro-duodenal plexuses, while the lower part receives fibres from the superior mesenteric plexus.

The *jejunum* and *ileum* are entirely supplied through the superior mesenteric plexus.

It should be remembered that the superior mesenteric plexus is very closely connected with the great solar plexus, of which practically it is little more than a prolongation downwards, and also that fibres of the right pneumogastric nerve enter it. Furthermore, it is stated by Head that the sensory nerves of the small intestine are derived from the ninth, tenth, eleventh, and twelfth dorsal spinal segments. After reaching the mesenteric border of the bowel, some branches enter between the longitudinal and circular muscular layers, forming what is well known as " Auerbach's plexus " ; while others extend into the submucous layer, where they also form a gangliated meshwork known as " Meissner's plexus." As in the case of the stomach, the ultimate endings of the nerve fibres have not been traced.

The *large intestine*.—As far as about the splenic flexure the large bowel is supplied by the superior mesenteric plexus ; but the descending colon and sigmoid flexure receive their supply from the inferior mesenteric plexus. The terminations of the nerves

resemble those just described in the case of the small intestine, and like that section of the canal also, the sensory nerves are derived from the same source —ninth, tenth, eleventh, and twelfth dorsal segments.

The *appendix* differs in no way from the other portion of the canal with which it is connected. Its supply is from branches that accompany the ilio-cæcal artery from the superior mesenteric plexus.

The *rectum* at its upper part is supplied by branches from the inferior mesenteric plexus, while below its supply comes from the hæmorrhoidal plexuses, derivatives of the pelvic plexuses. The sensory nerves come from the second, third, and fourth sacral nerves, which previously enter and help to form the pelvic plexuses.

The *liver* and *gall-bladder* are supplied by branches which come from the hepatic plexus, itself a derivative of the cœliac plexus. Entering the hepatic plexus are branches of the left pneumogastric ; and a few filaments from the phrenic ganglion. As this ganglion only exists on the right side, and has entering it from above branches from the right phrenic nerve, an indirect connection, therefore, possibly exists between this nerve and the liver and gall-bladder. According to Head, the sensory nerves are derived from the seventh, eighth, ninth, and tenth dorsal spinal segments, with possibly some from the sixth.

The *bile-ducts.* — The cystic and hepatic ducts resemble the liver and gall-bladder in their supply ; but the common duct receives its branches from

the gastro-duodenal plexus, a derivative of the hepatic plexus.

The *pancreas*.—The right half of the organ receives its supply from the hepatic plexus, through the pancreatico-duodenal plexus ; and the pancreatic plexus from the superior mesenteric plexus ; while the left half is supplied by the pancreatic plexus from the splenic plexus. To express this a little more succinctly, the supply is from the cœliac plexus and the superior mesenteric plexus. As the left vagus gives offsets to the hepatic plexus, and the right to the splenic and superior mesenteric, both vagi may be said to supply the gland. It is possible that the sensory supply of the pancreas comes through the splanchnic nerves, and if so it must correspond to the dorsal spinal nerves of about the lower six, but whether more to some than to others has apparently not been ascertained.

The *spleen* receives its supply from the splenic plexus, one of the primary derivatives of the cœliac plexus. Into the splenic plexus, it will be remembered, pass branches of the right vagus.

The *supra-renal capsules*.—These bodies seem to be supplied with nerves altogether out of proportion to their size. The supra-renal plexuses, which directly give the supply, are themselves lateral extensions of the great solar plexus. Through these plexuses also the capsules receive fibres from the great splanchnics and from the phrenic plexuses.

The *kidneys* and *ureters*.—The kidneys and upper portions of the ureters are supplied from the renal plexuses, and through these plexuses come branches

from the smallest splanchnic nerve and from the first lumbar ganglion. According to Head, the kidney receives sensory fibres from the tenth, eleventh, and twelfth dorsal spinal segments ; the upper portion of the ureter from the tenth, and the lower end from probably the first lumbar. The lower or pelvic part of the ureter receives its supply from the vesical plexus, a derivative of the pelvic plexus.

The *bladder* is supplied from the vesical plexus, an extension downwards of the pelvic plexus. According to Head, the mucous membrane and neck of the bladder receive their sensory supply from the second, third, and fourth sacral segments ; while in over-distension and ineffectual contraction the supply is from the eleventh, twelfth dorsal and the first lumbar. As will be referred to and described later, this latter supply has to do rather with the diffusion of pain than with any direct nerve-supply from these segments to the bladder.

The *prostate.*—While hardly to be considered as an abdominal organ, nevertheless the supply of the prostate—as also the testis—is such as to make it symptomatically as much so as any other organ situated more strictly within the cavity. The prostate is supplied by the prostatic plexus, a derivative of the pelvic plexus. The sensory supply, according to Head, is somewhat extensive, and given as connected with the tenth and eleventh dorsal segments, the first, second, and third sacral, and sometimes the fifth lumbar in addition.

The *vesicula seminalis* and *vas deferens* are supplied from the vesical plexus, branches also coming from

C

the prostatic plexus. The vas as it passes down the spermatic cord is supplied by the spermatic plexus.

The *epididymis* and the *testis* are supplied from the spermatic plexus. The epididymis, according to Head, receives its sensory supply from the eleventh and twelfth segments and the first lumbar, while the testis is supplied from the tenth dorsal.

The *ovary* receives its supply from the spermatic (ovarian) plexus and from the pelvic plexus. Its sensory nerves are by Head associated with the tenth dorsal segment.

The *Fallopian tube* receives a sympathetic supply similar to that of the ovary, but in addition a branch direct from the hypogastric plexus; but its sensory associations are, according to Head, with the eleventh and twelfth dorsal and the first lumbar.

The *uterus* appears to be more abundantly supplied with nerves at the cervix than in the body. Its branches come mostly from the pelvic plexus; but others are derived from the spermatic (ovarian), and one branch, continued direct from the hypogastric plexus, reaches the posterior part of the body. The sensory associations, according to Head, are, with the third and fourth sacral, in the lower portion of the cervical canal; while the upper portion, in the region of the internal os, is related to the eleventh and twelfth dorsal.

The *peritoneum* receives its supply in common with the particular organs or tissues with which it is associated. In the case, therefore, of the viscera, the supply will be derived from the various sympathetic plexuses, while the parietal peritoneum will be supplied by the dorsal, lumbar, and sacral

spinal nerves, except the under-surface of the diaphragm, where branches will be derived from the phrenics and from the phrenic plexus. The mesentery is supplied by the superior mesenteric plexus, as also the meso-appendix, the ascending meso-colon, and the transverse meso-colon. The descending meso-colon, the sigmoid meso-colon, and the meso-rectum are supplied by the inferior mesenteric plexus. The lesser omentum is supplied from the hepatic plexus, and the great omentum from branches of the hepatic and splenic plexuses which course along the great curvature of the stomach with the right and left gastro-epiploic arteries.

CHAPTER IV

THE CORRELATION OF THE DIFFERENT PARTS OF THE NERVOUS SYSTEM — SPLANCHNIC AND SOMATIC.

HAVING discussed the nerve-supply of the wall of the abdomen, and the viscera contained within or connected with its cavity, it almost of necessity follows that the relationship which subsists between the two should next be considered. Such a consideration also tends to bridge the gap, or unite together, what on the one side may be regarded as purely anatomical and physiological, and on the other as clinical. It is in this association that we seek to throw light upon some of those obscurer phases of disease which, without such elucidation, may be misunderstood, even if they do not actually mislead.

Much good work has already been accomplished in this particular line; and although in certain connections there has been some want of agreement in the opinions of individual observers, nevertheless there is much that is extremely valuable and suggestive.

In that delightful book on "Rest and Pain," Hilton was one of the early observers to show how frequently disease in some deep-seated part was indicated by pain along the peripheral distribution

of nerves that took a common origin with those
that went to the source of the mischief. But
while Hilton approached his subject mostly from
the clinical side, others have sought to show the
same connections from the purely anatomical.
In this connection may be mentioned the work of
Gaskell "On the structure, distribution, and func-
tion of the nerves which innervate the visceral
and vascular systems." * Gaskell's work consisted
in tracing the source of the various medullated
and non-medullated fibres from the cord to the
viscera, and determining also the respective func-
tion of these constituents. Edgeworth followed
much upon the same lines in his paper "On a large-
fibred sensory supply of the thoracic and abdominal
viscera." † It is, however, more with the work
of Ross, Head, Thorburn, and Mackenzie that we
have to deal. Ross, in a paper " On the Segmental
Distribution of Sensory Disorders," ‡ after demon-
strating the connection between the visceral or
splanchnic nerve-supply and surface nerve-supply
of the body or somatic, held the view that the
pain of visceral disease was referred primarily to
the area of distribution of those sensory somatic
fibres taking origin from the same spinal segment
as the visceral sensory fibres. Mackenzie, in a
paper entitled " Some Points bearing on the Associa-
tion of Sensory Disorders and Visceral Disease," §
also contended that pain in visceral disease was a
referred pain ; in other words, that pain connected

* *Journal of Physiology*, vol. vii. 1886, p. 1.
† *Ibid.* vol. xiii. 1892, p. 260.
‡ *Brain*, vol. x. 1888, p. 333.   § *Ibid.* pt. iii. 1893, p. 324.

with disease of an internal organ was felt as if at the peripheral distribution of a spinal nerve. But, unlike Ross, he did not believe in visceral pain. Both observers worked on the same plan of observing their cases clinically, and mapping out the various courses taken by pain arising from the disease of certain viscera. Thorburn's attention was directed solely to " the sensory distribution of spinal nerves," * and was worked out on the basis of observing the sensory and motor results accruing from lesions at certain levels of the spinal cord. The most exhaustive labourer, however, in this field is Head, whose work finds constant reference in most writers on the subject. The title of his paper is " On Disturbances of Sensation with especial Reference to the Pain of Visceral Disease." † I give the following quotation from Head's original paper, as best indicating the lines upon which he worked. " . . . pain was in many cases associated with definite cutaneous tenderness. Moreover, the cutaneous tenderness was in many cases not confined to small spots or areas, but occupied whole tracts of skin with definite borders. I was thus led to investigate the pain and accompanying tenderness consequent on disturbances of other organs, and I found that these sensory disturbances also followed definite lines. After Ross's most suggestive papers it seemed exceedingly probable that these areas bore some definite relation to nerve distribution, and I then began to investigate the distribution of herpes zoster in the hope that a skin lesion which was notoriously of nervous origin

* *Brain*, pt. iii. 1893, p. 355.   † *Ibid.* vol. xvi. 1893, p. 1.

C. 3.
C. 4.
D. 2.
D. 4.
D. 6.
C. 6.
D. 8.
D. 2.
D. 10.
D. 12.
C. 8.
L. 2.
L.. 4.
SAC. I.

D. 3.
C. 5.
D. 5.
D. 3.
D. 7.
D. 9.
D. 11
C. 7.
L. I
D. I.
L. 3.
L. 5.
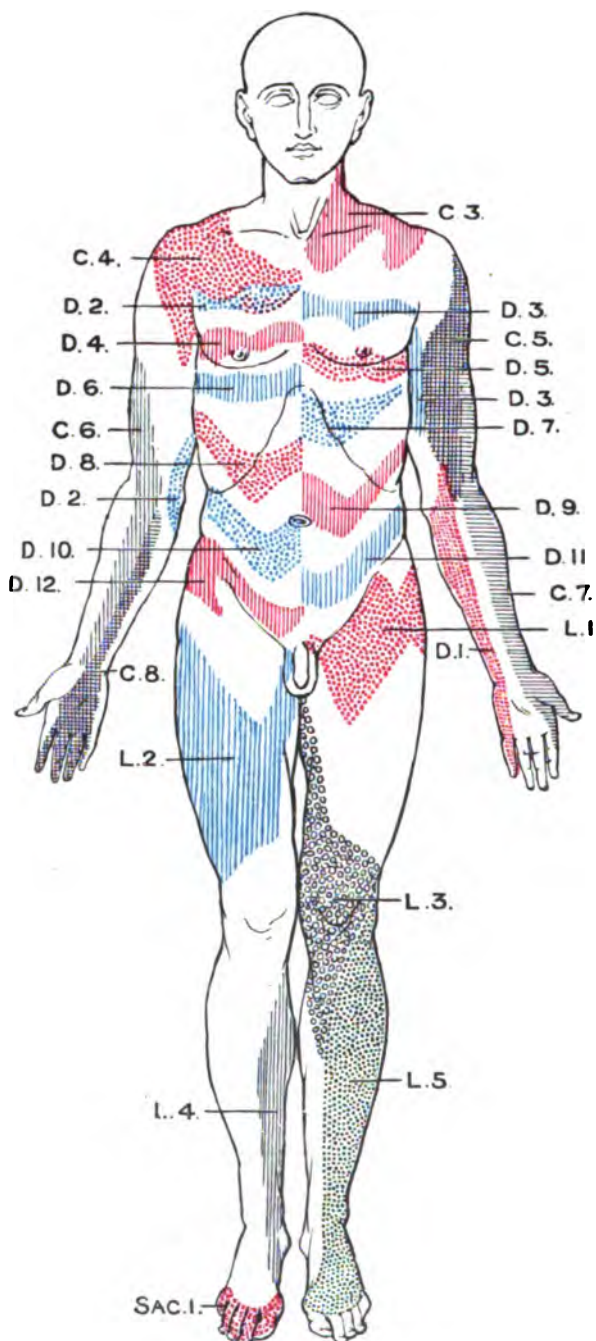
FIG. 8.

Fig. 8 shows segmental cutaneous areas. The several dorsal, lumbar, and sacral areas are indicated each by the initial letter followed by a number. (From Quain after Head.)
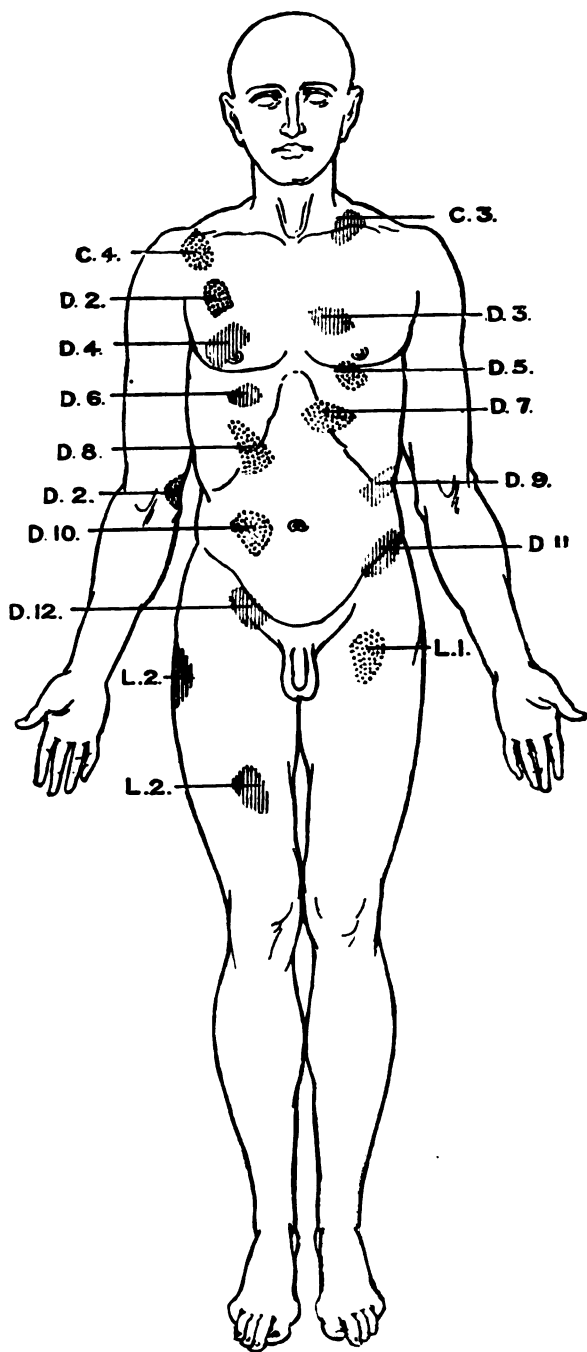
FIG. 9.

Fig 9 shows the "maximum spots" (seat of most marked tenderness and pain) of the different areas. (From Quain after Head)

might throw some light on the meaning and significance of the tender areas in visceral disease. To my surprise, I found that the areas occupied by herpes zoster exactly corresponded to those with which I was familiar in visceral disease. I next attempted to determine to what level of the nervous system these areas belonged with the help of cases in which gross organic lesions were present. By this means it became apparent that each of these areas represented the distribution of a single nerve-root or of a single segment in the spinal cord. Thus I was enabled to map out the areas supplied by the various segments of the cord on the surface of the body." (*See* Figs. 8, 9, 10, and 11.) " It then became apparent that certain of these areas were never affected in visceral disease, and this led me to examine the sensory supply of the viscera from the sympathetic system. Now Ross had already suggested that in visceral disturbances pain (and therefore in my cases tenderness) was referred along the distribution of the somatic nerves which came off from the same part of the cord as the sensory sympathetic fibres to the organ affected. Thus, if I could map out the somatic areas along which pain was referred in visceral disease I could say, on Ross's hypothesis, what was the sensory supply from the sympathetic of the particular organ affected. By this means I obtained another scheme, showing the distribution of the sensory sympathetic fibres analogous to that which Gaskell constructed for the motor and inhibitory fibres of the same system."

A special feature in these areas of cutaneous

tenderness is the fact that they do not overlap.
Unlike simple tactile sensation, each area remains
quite distinct and well defined from the neighbouring
areas. Furthermore, in each area there are usually
two points or places described as " maximum
points " or " maxima," where the tenderness is
most marked, and which corresponds to the places
where pain is most distinctly felt. (*See* Figs. 9
and 11.)

To sum up, then, the result of Head's work, we
have it that the somatic distribution of referred
pain is not so much along the course of definite
nerves as that it corresponds to the cutaneous
supply of *segments of the spinal cord* from which
the posterior nerve-roots in part arise.

CHAPTER V

ON THE SPECIAL CHARACTERISTICS AND PRIMARY CAUSES OF ABDOMINAL PAIN.

It is not intended to discuss the whole subject of pain, but it is impossible to exactly limit what has to be said to pain as it attacks the abdomen alone.

Pain may be briefly defined as Nature's indication that her laws are in some way being transgressed, and its cause may with equal brevity be described as an excessive or abnormal stimulation of a part of the nervous system specially associated with the region affected. Easy as it is in a general way to thus define and describe what pain is and how it is caused, it becomes a totally different matter when we have to deal with it more specifically and try to determine its peculiar characteristics and special causes.

In the first place, pain is a sensation peculiar in its own properties. In many instances we can only express it in comparisons that suggest physical states with which we are familiar. In other cases we use terms that may be said to be derived from what we actually know produces a definite sensation of pain. Thus, to cut the skin produces a sensation from which we derive a " cutting " pain ; to prick the skin, a " pricking " pain ; to scratch or irritate

an open sore, a " smarting " pain—and so on. But such terms as " screwing," " boring," " stabbing," " shooting," " darting," " lightning " are only known from their imaginative likeness to certain physical influences. Again, the expressions " dull," " gnawing," " wearing," " teazing," " tearing," " dragging," " stooning " are all difficult to explain, except on the ground that they suggest certain external processes or conditions with which we are familiar and which have a suggestiveness that sufficiently serves to indicate what is felt. Many of these terms, also, have a meaning which is intended not only to suggest the peculiar character of the pain but its degree of severity. Thus, a cutting pain implies a sharp or acute pain, short in its duration and often intermittent ; while a gnawing pain is understood to mean a more or less constant pain of not undue severity.

However difficult, therefore, it may be to obtain any rational classification of the characteristics of pain, such terms as are employed have come to have a more or less sufficiently well-understood recognition and meaning ; and while the question of intensity has many complicating factors, we may take it that the special characteristics of pain as above described are sufficient for the purpose, and constitute a valuable aid in the practical scheme of diagnosis.

When we regard the subject of degree or intensity of pain, we encounter difficulties in many respects much greater, in the matter of similitude, than in the case of its peculiar characteristics. For, given precisely the same lesion, we may have in one instance what will be described as simply sub-

acute, while in another it will be intensely acute. We have ample evidence in many ways of how differently individuals bear pain. But I have no intention of discussing the many causes which have to be considered in explanation of these—what may be called constitutional—differences ; only we must bear them in mind in order to gauge correctly the importance it may be necessary to attach to them in individual cases. Without multiplying examples, I may instance the pain connected with a strangulated hernia. In the case of a young adult the pain may be extremely acute, while in the aged it may be so slight as to deceive the inexperienced into the belief that, with possibly a similar feeble manifestation of other symptoms, no such grave lesion exists. Or take as another example, that resulting from temperament or constitution, rather than age. Contrast the finely developed and sensitive nervous system of one whose life is a labour of mental activity with that of one whose employment—like that of a navvy—is concerned in almost purely automatic muscular work. What may be acute in the one case may only be subacute in the other.

The really acute pain which occurs most frequently in the epigastrium as the result of some grave internal lesion is of a most unmistakable character. Its most distinct features exist in the immediate and after effects. Thus at the time of seizure the patient is completely overcome by it, being, as the patient usually expresses it, "doubled up" with the pain. Following shortly upon the seizure is the state of prostration, represented by the well-known physical signs of facial pallor, frontal perspiration, feeble

pulse, and a general lethargic condition of the nervous system. This state lasts for a longer or shorter time until a period of reaction sets in, when the symptoms may then become more suggestive of the real mischief which has taken place. There is very little likelihood of mistaking the meaning of acute pain of this character; but from its gravest manifestation down to where the difference of age or constitution may be the sole factor in determining whether the pain is " acute " or simply discomforting, there is every degree of shortness and sharpness of the seizure.

The Primary Cause of Abdominal Pain.—Assuming, as has been done, that pain is the result of over-stimulation or undue functional activity, it is difficult not to regard the sensation as produced and actually felt at the seat of its origin. That it is often reflected or referred all are agreed. But there is doubt in the minds of some observers whether pain is anything other than a referred pain ; that, in other words, the viscera are not capable of themselves of eliciting pain (Mackenzie). If we were to base our reasoning on tactile sensation, then the fact that we are quite unconscious of our internal viscera when in normal action might be some excuse for not believing that the sense of pain was capable of being experienced within them under certain abnormal conditions. But pain, as is well known, is a sensation quite distinct from that of touch. We may find parts of the body surface anæsthetic but not analgæsic. There is, therefore, no reason for doubting that under certain abnormal conditions pain may be evoked in particular viscera otherwise quite insensitive. It may be, and indeed probably is a fact, that

certain sensory fibres of spinal origin find their way to every viscus, and that it is due to the excessive or exaggerated stimulations of these that pain arises; or, again, it may be that fibres subserving other functions, when abnormally excited, lead to a similar manifestation. Whatever be the channels by which the sensations of pain are conveyed, most clinicians, I imagine, will be inclined to agree that internal viscera and certain other structures within the abdomen do give rise to the sense of pain felt actually in the organ or structure itself.

Regarding more strictly the causes of pain, it would seem that abnormal distension of a muscular viscus or canal leading to excessive or exaggerated contraction of the wall of the same is a fertile source in many instances. Thus any portion of the alimentary tract, when incapable from stricture or other obstructing cause of normally passing on the contents of one section of the canal into another, begins to distend on the proximal side; and by exciting renewed and increasingly more vigorous efforts at muscular contraction, causes pain. Similarly also a gall-stone in the bile-ducts; a renal calculus in the pelvis of the kidney or the ureter; a concretion in the appendix; or retained secretion or exudation in the Fallopian tube, may in like manner evoke such exaggerated efforts on the part of the muscular tissues to remove the distending obstacle, that pain is the result. These muscular pains vary in their degree of acuteness, but mostly possess one feature in common, that they are sometimes prolonged, often repeated, and in some instances capable of being invoked. Such terms as " cramp," " colic,"

" gripe," " spasm," " screwing," are used to describe the special characters of the pain.

Another primary exciting cause of pain is some irritant of a chemical or microbic nature acting on the mucous or serous linings. In some instances this influence is similar in its results to that above described. An undue and excessive contraction of the muscle fibres is brought about in the endeavour of the part to rid itself of its irritating contents. In cases such as these a similar series of pains may be produced. But, apart altogether from muscular action, the abnormally irritating effect upon the internal lining wall is capable of producing sensations of a totally different character. Thus the pain may be " burning," " gnawing," " smarting," and in the case of serous linings, " cutting " ; or there may be a simple sense of " soreness " or " rawness." Under this same heading of chemical or microbic stimulation may be included the more advanced condition of inflammation and ulceration.

A third cause of pain is probably to be found in the abnormal distension of encapsuled viscera. The liver, spleen, pancreas, kidneys and ovaries are all encapsuled, and their intimate structure contains also a quality of connective tissue. The formation of these capsules and interlacing connecting fibres is not only to enclose and maintain the structure as a whole, but to admit, within certain limits, of a distension of the organic tissue proper when under the normal conditions of functional activity. Now it can be well understood how nature should manifest itself in the usual way by causing pain when its normal functional limits are exceeded. Nature does

not so much resent *gradual* enlargement, but acute
and rapid distension it apparently does, so that
when an organ becomes inflamed, the engorgement
which necessarily accrues stretches and puts into
abnormal tension the capsule and various connecting
fibres. By pressure, therefore, or by stretching of
the nerves, which in all probability freely supply
the internal parts of every encapsuled organ, pain
is produced.

A fourth source of pain is found in the invading
process of tumours or aneurysms. This may be due
to one or other of the causes already given, that is
to say, either to stretching of tissues or to irritation.
Thus the erosion of the bodies of the vertebræ by
a slowly increasing aneurysm will tend to expose
and irritate nerve fibres ; and the destructive and
invading forces of a malignant growth may produce
a like result. On the other hand, the growth of a
tumour may unduly stretch or distend the tissue
and so cause pain. Under the same heading must
be included the extravasation of blood which,
occurring, for instance, in the mesentery, may cause
acute pain.

As a very fertile source of pain must be mentioned
irritation of the parietal layer of the peritoneum.
There is no doubt that the peritoneum which lines
the abdominal wall is much more sensitive than that
which covers the various viscera. It is probable
that this fact is due to the nerve-supply being much
more from the spinal nerves than is the case of the
viscera, and also to the existence in its substance
of Pacinian bodies. It appears to be peculiarly
sensitive to the contact of foreign matter. Every

operating surgeon knows that he may handle the
viscera without causing pain, but to touch the
serous lining of the abdominal parietes is at once
to cause acute pain. Again, in most of the acute
abdominal crises the pain is caused by the contact
of some foreign or potently irritating material
on the surface of the peritoneum. Thus the extra-
vasation of blood into the pelvis from a ruptured
ectopic pregnancy is usually accompanied with acute
pain ; and it is not improbable that the acute
pain felt in connection with ruptured or perforated
viscera is due to the contact of material which proves
extremely irritating to the sensitive parietal peri-
toneum.

CHAPTER VI

THE DIAGNOSIS OF PAIN.

THE subject may be regarded from two different aspects. In the one, the untouched patient manifests pain; in the other, the clinician elicits it. The patient may describe the pain as deep-seated or superficial: either in some particular organ or tissue, or as if in the cutaneous structures. It is impossible not to believe that the patient's consciousness of pain, which he feels as if seated in some deep structure, is not a true interpretation of actual pain produced in the part itself. Although Mackenzie* inclined to the belief that all pains were referred or somatic, Ross's contention that visceral or splanchnic pain did exist will find most favour with the majority of clinicians. The true character and really distinct feature of visceral or splanchnic pain is that it is located exactly where the organ is itself. Did Hilton's dictum † universally hold true, that the nerves which supplied a deep-seated part—as, for example, a joint—supplied the muscles that moved or guarded the part, and the skin over the same, then we might have some difficulty in differentiating between surface and deep-seated pain. But we know that, so far as the abdominal viscera are

* *Medical Chronicle*, vol. xvi. 1892, p. 322.
† " Rest and Pain," p. 151.

concerned, that this anatomically is not the case;
and therefore, except on the basis of real splanchnic
pain, it is difficult to offer any other explanation.
There is another characteristic of these pains which
strongly suggests their deep-seatedness. They are
invariably described by terms which rarely receive
any other application than that of some deep asso-
ciation. Thus we are familiar with a " gnawing "
pain, a " dull " or " heavy " pain, a " griping "
pain, a " wearing " or " aching " pain. When,
however, we come to true referred pains, they are
usually more of the acute kind, due, no doubt, to the
more abundant supply of sensory fibres from the
spinal nerves, and the terms employed, such as
" cutting," " sharp," " stabbing," " pricking," be-
come equally as suggestive. I think, therefore,
it may be taken as a clinical fact of no little im-
portance that when we have a patient who com-
plains in terms such as those given above in the first
series, we are dealing with disease or derangement
of the organs which the regional pain suggests ;
and still more likely does this become when we have
associated with the deep-seated pain well-defined,
referred, reflected or sympathetic pains, traceable
in their nerve distribution to the same spinal segment
as that which supplies nerves to the deep-seated
part.

In rightly interpreting the clinical value of these
deep-seated pains it is necessary to distinguish
between a pain that is apparently non-invoked and
one that can be induced by certain means employed
by the patient himself. Not only may these means
help in determining the character of the lesion, but

they may also afford some gauge as to its extent.
Take the typical illustration of a gastric ulcer, as
contrasted with that of partial pyloric obstruction.
Pain is called forth in gastric ulcer by the ingestion
of food of almost any kind, while in narrowing of
the pylorus it often only follows upon the taking
of certain solid substances which fail to be reduced
to the proper consistency for an easy passage through
the obstructed outlet; on the other hand, fluid, soft
and finely divided foods pass without causing pain.
Again, stone in the pelvis of the kidney often causes
more pain when the patient moves about. The
same happens in cases where adhesions have formed
between the abdominal parietes and parts which
are usually movable within the abdomen. Instances
might be multiplied, but these suffice to show that
when we are properly investigating the value to
be attached to a patient's complaint of deep-seated
pain, we must always seek to ascertain whether that
pain can be induced or augmented by any voluntary
efforts or means on the part of the patient.

From the clinician's aspect there are two con-
siderations, both of which have regard to the employ-
ment of palpation, or the actual production of pain
by the investigator. In the one, pain is elicited by
deep pressure ; in the other, the cutaneous surfaces
are tender and hyperalgæsic, and require but slight
stimulation to evoke pain.

There are a few simple rules to be remembered
in all examinations of the abdomen by palpation,
as much for the eliciting of pain as for the detection
of intra-abdominal tumours. The patient should be
placed in the recumbent position with the shoulders

raised and the knees bent so as to relax the recti and render the abdominal parietes flaccid. He should also be instructed to open the mouth and breathe easily, and do generally all in his power to relax his abdominal muscles. The hand should be warmed, or at least not colder than the patient's skin. The whole hand should be spread upon the parietes and passed over the entire surface once or twice before any deep pressure is exercised. If the abdomen tolerates the smooth extended palmar surface, and there is no excitement of muscular contraction, the tips of the index, middle, and ring fingers may be gently and gradually depressed. If by this means a painful area is discovered, the tip of one finger may be alone used in order to detect more exactly the part of greatest sensitiveness. It should be still further noticed whether, in addition to the pain produced at the seat of pressure, a reflected or referred pain is invoked. It occasionally happens that the area over which pain can be produced by pressure is much larger than the supposed seat of disease might suggest it should be. This is due to the dragging of more remote parts upon the affected region. Thus, in some cases of appendicitis, where, either from the position of adhesions or the disposition of the bowel, pressure at some distance may cause pain, and even mislead into the belief that a general peritonitis exists. It may be taken as a rule that extreme hypersensitiveness to pressure as distinguished from cutaneous hyperæsthesia is an indication of inflammation of the peritoneum. This applies not only to the abdominal parietes proper, but to the diaphragmatic

surface and the lining wall of the pelvic cavity. If a patient with inflammation of the under-surface of the diaphragm be asked to draw a deep breath, he is unable to do so without suffering an acute pain. And if a digital examination be made either of the rectum or vagina, acute pain is felt immediately the parts of these canals covered by peritoneum are pressed upon. In the case of the vagina, tilting up of the fundus by pressing on the cervix always causes acute pain in pelvic peritonitis. It should be further noted that in certain cases of deep inflammatory mischief either at the brim or in the cavity of the pelvis bimanual pressure may be necessary in order to elicit pain. It is only in this way that the appendix vermiformis, when situated in the pelvis, can be palpated when inflamed; also the ovary and Fallopian tube when similarly affected. Bimanual examination is frequently called for in deep-seated disease situated in either flank. Thus kidney conditions are often only detected by firm pressure exercised from behind with the fingers of one hand, while counter-pressure is made in front with the fingers of the other. The same applies to the gall-bladder on the right side and the spleen on the left. The ascending and descending colon similarly come under the same method of examination.

The other diagnostic measure employed by the clinician is the detection of cutaneous tenderness. The importance of this manifestation of pain was first demonstrated by Mackenzie,* and a little later but otherwise independently by Head. Head's work has been fully referred to in a previous chapter

* *Medical Chronicle*, 1892, vol. xvi. p. 295.

(*see* p. 38) and the areas corresponding to certain spinal segments mapped out on the surface of the body (*see* Figs. 8 to 11). There are four ways in which search may be made for these tender spots or areas : first, by pinching up the skin between the thumb and forefinger ; second, by using the sharp point of a pin ; third, by using the head of the same ; and fourth, by drawing either the head or point across the surface.

Now all elicitation of tenderness implies only a skin sensation, nothing deeper, and is the local manifestation of reflected or referred pain. From a diagnostic point of view, therefore, it aids only by suggesting the deep source from which the pain arises or the particular seat of the primary disease. In other words, we determine by this means the particular segment of the cord involved, that segment to which the afferent nerves come from the diseased organ, and from which the efferent nerves pass to the cutaneous hypersensitive surfaces. It is always to a particular spot within these hyperalgæsic areas, that the patient points as the seat of the referred pain. This will be seen more clearly when we come to regard the algæsic manifestations in the disease of particular viscera. At present we are simply considering the general question of how to diagnose the existence of pain.

There are two other considerations it is important to take note of. The first is, that referred pain and tenderness may exist on the opposite side of the body to that in which the disease or diseased organ is placed. We cannot say why this should be, although anatomically it is not difficult to explain.

The nerves which pass to the side on which the pain is referred come off from the same segment of the spinal cord as that to which the nerves come from the affected parts; but why the nerves for this transference should be selected from the opposite side, any more than from those of the same side; or why the nerves of both sides should not be involved, it is as yet impossible to say. Suffice it for our practical purpose to remember that this may be the case in any disease affecting a deep-seated part. If any particular example of this were needed, we might instance the case of renal disease, where perhaps more frequently than in any other complaint we are apt to get pain on the opposite side to that in which the affected organ is situated. It will be at once seen, that the best check, to any possible mistake arising out of the belief that a referred pain or cutaneous tenderness indicates disease on the same side, is the unmistakable detection of deep-seated pain elicited by palpation on the opposite side, and not on that of the cutaneous manifestation. But, as often happens, this counteracting factor is absent, and then it becomes necessary for us to fall back upon other clinical symptoms to help us in avoiding what otherwise might lead to serious consequences in the matter of treatment.

The other consideration is even more puzzling sometimes than that just referred to. It concerns the wider distribution of pain than that which strictly represents the deep seat of the disease. Acting on the assumption, as has been done in explaining referred pain, that a particular segment

of the spinal cord is the means of receiving impressions on the one hand and distributing them on the other, we have but to assume, as a further link in the chain, an excitation of neighbouring segments of the cords in order to get pains produced more remotely. Now there are three ways in which it is possible for this diffusion to take place: first, by reducing the resisting power of the neighbouring segments; secondly, by increasing the excitability of the involved segment; and thirdly, by prolonging or augmenting unduly the stimulating power.

In illustration of the first of these ways, we have general or constitutional diseases which reduce the body powers generally and the nervous system in particular. Thus, in anæmia it will be frequently found that any localised pain-producing centre is liable to call forth pains in various other parts of the body. The same sometimes happens in pulmonary tuberculosis. In illustration of the second way are fevers; these, in causing a rise of temperature, raise the general sensitiveness and excitability of the nervous system, and so lead to the appearance of pain far removed from any localised source. And in illustration of the third way may be instanced chronic localised disease, which may act not only in reducing the resisting powers of the segments, but by constant stimulation of the specially involved segment lead to a direct extension to others in the immediate proximity. Thus chronic ovaritis or metritis is a very fruitful source of widespread and remotely situated pain. There is another cause of remotely distributed pain which is to be found in organs that may be said to possess certain

special functional relationships. These associated pains are difficult to explain on any anatomical basis, especially such as has just been described. The type referred to is best illustrated in the case of the ovary and the breast, and it is probable that there are many others of a similar nature with which we are, as yet, unfamiliar.

In attempting to avoid, as much as possible, the errors into which these diffuse and often apparently irregularly disposed pains are apt to lead, an endeavour should be made to seek for the earliest manifestations of pain, and then to take into consideration any other exciting causes, constitutional or otherwise, which might explain the indefiniteness of the subsequent developments. One, perhaps, of the most frequent mistakes, which the clinician is liable to commit, is to too hastily regard these distributed pains as manifestations of hysteria or hypochondriasis. More particularly is this the case when the pains have their primary origin in some disease of the genital organs.

Having now discussed the methods employed in the diagnosis of pain and the value to be attached to its varied and multiple manifestations, I propose to take up each organ individually and describe the special characteristic of the pain produced by the different diseases which affect it. After completing the subject from this aspect I shall reverse the consideration of it and take up certain prominent seats where pain is felt, and follow out its possible significance in the diagnosis and differentiation of disease.

CHAPTER VII

PAIN IN AFFECTIONS OF THE ALIMENTARY CANAL.

Stomach.—Numerous as are the derangements of the stomach, both functional and organic, pain as a distinguishing feature between them is not marked, often indeed even misleading. In the affection of no other viscus probably does it become more necessary to consider the existence and characteristics of associated symptoms. We have come to know, largely through the intervention of exploratory operations, that pain which used to be considered as distinctive of certain supposed well-defined conditions is no longer so. We are becoming more and more narrowed down to the fact that gastric pain is a product of many local disturbances, which has as its manifestations the same seats both deeply and superficially; and frequently, when we have to make use of these particular evidences, to be of value, it has to be by some means exercised either on the part of the patient or the clinician.

Now the commonest seat of gastric pain is in the epigastrium, just below the xiphoid cartilage—in what is popularly called the " pit of the stomach." Next to this seat comes the dorsal area situated between and at the lower part of the scapulæ, and

about opposite the spinous process of the fifth dorsal
vertebra.   In addition, the pain sometimes circles
round from the one region to the other on the left
side.   While these are the places at which pain is
felt, tenderness also is elicited by palpation of the
same areas.   These pains are " referred," or " re-
flected," and more or less correspond to the nerves
which come off from the seventh, eighth, and ninth
dorsal segments (Head, *see* Fig. 8).

If there are distinctive pains of any particular
disease, they mostly belong to the deep-seated class,
and are those which it is frequently possible to evoke.
Thus chronic ulceration of the stomach, either of
an innocent or malignant character, may give rise
to a burning or gnawing pain constantly present,
and either increased or sometimes diminished by
the ingestion of food.   But it must be equally re-
membered that the absence of such manifestations
in no way mitigates against the possible existence
of ulceration.   We are sufficiently familiar with the
fact, that the most extensive destruction of the
mucous membrane and underlying tissues may take
place, and death from sudden perforation ensue, with
an entire absence during life of attractive pain.
And here I would like to briefly observe, how
frequently of late it has happened to surgeons to
operate for supposed gastric ulcer, and find no
vestige of such a lesion.   Treves* quotes a case in
his practice; Bradford† one in his; two have
fallen to my own hands; and others have come to
my knowledge.   In one of mine the diagnosis had

* *Lancet*, 1896, vol. i. p. 18.
† *Trans. American Surgical Association*, 1892, vol. x. p. 219.

been made by several physicians ; and the evidences were so convincing—as I supposed—that I did not doubt in my own mind that a typical gastric ulcer would be found. Yet with a most searching examination outside and inside the stomach, not a lesion could be discovered. I think these revelations instructive, and weaken very considerably the opinion of those who repeatedly affirm that, with a very large experience of cases of gastric ulcer, they attain most successful results in following certain specified lines of treatment which they personally are in the habit of employing; the real truth probably being, that the majority are not cases of chronic gastric ulcer, and that the very cases, which they do not succeed in more than temporarily relieving, are the true cases of the disease.

It is pointed out in works on Clinical Medicine that the situation of an ulcer may be determined by, first, the time taken from the ingestion of food till the onset of pain ; and, secondly, the relief which it is possible to obtain by altering the position of the body. Thus, as the interval of time increases between the taking of food and the appearance of the pain, so is the distance of the ulcer from the cardiac orifice also supposed to be increased ; and if a patient, by turning in some position, can get relief after the ingestion of food, so is it considered probable that the ulcer is situated at that particular place removal from which gives relief. In regard to the position of the ulcer in relation to the two orifices, Head* is of opinion that when the ulcer is situated near the cardiac orifice the sixth and seventh dorsal

* *Opus cit.* p. 69.

areas are affected, and when near the pyloric orifice, it is the ninth dorsal area (*see* Figs. 8 and 10).

While, then, it may be taken that pains in the epigastrium and between the shoulder-blades are the most typical seats for the manifestation of gastric diseases, they far from exhaust the places in which pains may appear. Such a simple condition as functional dyspepsia may cause a sense of weight and discomfort extending upwards from the epigastrium to the mid-sternum or even higher. In cases where there is extensive rather than limited disease, pain and tenderness may spread over a considerable area on the front of the upper abdomen, round the left side, and on a comparatively broad surface of the dorsal region. Again, when from any cause perigastritis exists, the seat of pain and tenderness is found more particularly over the seat of inflammation. Thus, when as not unfrequently happens, this inflammation involves the pylorus, the tenderest spot will be to the right of the middle line. The adhesions also which result from the perigastritis produce pain at their seat, a pain, too, which may sometimes be invoked by any action which puts them on the stretch. The acute pain of perforation presents nothing which would enable it to be distinguished from perforation of any other viscus ; it is the acute prostrating pain so typical of every grave intra-abdominal lesion ; the previous history of ulceration is often the only guide to its true connection. In obstructive dilatation, whether the impediment be at the pylorus or at some intermediary portion of the body, as in hour-glass contraction, cramp-like or " screwing-like " pains, often

also sharp and cutting in character, occasionally appear when the organ is powerfully contracting in its fruitless efforts to discharge its contents. These contractions are often seen as large globular-like peristaltic waves passing from left to right, and may be accompanied also with a sense of burning, relief from which is obtained by vomiting or washing out the stomach. In gastralgia and other irritative sensory neuroses of the stomach, pain is often out of all proportion to other physical manifestations of any suggestive disease. The patient may complain of a beating or pulsating sensation, of a feeling of heat or cold. The attack may be spasmodic or periodical in character, alternating with intervals of complete freedom.

Duodenum.—There is little that can be said to be positively distinctive of duodenal pain either in its character or in its seat. With duodenitis there is practically no pain, and that the portion of the bowel is inflamed is usually suggested by the concomitant jaundice, due to the temporary blocking of the orifice of the common duct by the swollen mucous membrane.

In ulcer of the duodenum, when situated, as it most frequently is, near the pylorus, the pain is epigastric and quite indistinguishable from ulcer situated on the gastric side of the pyloric orifice. Buequoy,* however, in an exhaustive paper on the differential diagnosis between Gastric Ulcer and Duodenal Ulcer, seeks to enforce that the two conditions are distinguishable, and gives, as special

* *Archives Générales de Médecine,* 1887, vol. i. pp. 398, 526, 691.

features of the latter, the position of the pain at
a zone corresponding to the inferior border of the
liver and between the border of the false ribs and
the crest ; and acute attacks of colic, occurring
three or fours hours after the ingestion of food.
The referred pains resemble those arising from the
stomach, and may be acute or stabbing ; while the
deep-seated may be burning.   The diagnosis, how-
ever, of affections of the duodenum will rest more
upon the combination of other symptoms with
pain than upon any special peculiarity of the pain
itself.

Small Intestine.—It is not possible to draw
any hard-and-fast line between the seat and character
of the pains produced in diseases of the small and
large intestine respectively.   And this is what might
be expected when we remember that the superior
mesenteric plexus supplies the whole of the small
intestine and a great portion of the large.   It
follows, therefore, that referred pains must be
located at the same place, whether they take their
origin from disease of some portion of the jejunum
or from the ascending colon.   Referred pains, how-
ever, are not often met with, except in those cases
where the gut has got sharply nipped by bands or
other such causes producing either external or
internal strangulation.   Then a sharp, agonising
pain is felt in the umbilical region.   Inasmuch as
this is the place, deeply beneath which the solar
plexus is situated, the explanation of the pain is
probably to be found in its reflection from nerves
passing between this plexus and the spinal nerves
distributed to the skin around the umbilicus ;

that is to say, through the medium of the splanchnics and the ninth or tenth dorsal spinal nerves.

The deep-seated pain of affections of the small intestine is diffuse in character. The length of the gut, its numerous coils and the way in which these intermingle and overlap, prevent anything like localisation. Enteritis is not a painful disease, but the passage of irritating materials may give rise to the well-known " griping " or " sickening " pains which occupy more or less the whole central part of the abdomen. These pains do, however, sometimes begin above and gradually descend downwards, relief being afforded by the ejection of the irritating contents.

The most suggestive pains connected with the small intestine are those which arise from obstruction of some kind. When the bowel is narrowed from any cause, an obstacle is introduced to the easy transference of the contents of the gut above the obstruction to the part below it. So long as the normal contractions of the bowel above can overcome this impediment, not even discomfort may be felt, but immediately the contractions have to be considerably augmented either in frequency or degree, or more probably in both, pain is developed, and goes on increasing in direct proportion to the amount of obstruction to be overcome. The pain is cramp- or gripe-like in character and felt as deep-seated, or in the abdomen. At first the intervals between the spasmodic attacks are considerable, occurring only once a week it may be, but soon the periods between one spasm and another become so reduced as to disappear altogether, and the pain becomes constant.

Should the obstruction from any cause become complete, an attack of sudden agonising pain results, and we have then the symptoms of what is usually understood by acute intestinal obstruction. The following case may be instanced as one illustrating some of the points above indicated. It was that of a young woman who—as it was subsequently found at operation—had tubercular ulcers and strictures of the lower part of the ileum. She was twenty-six years of age, and stated that her illness had commenced about three years previously, when she began to have cramp-like pains across the stomach and abdomen, and suffered also from increasing difficulty in getting a movement of the bowels. She noticed on several occasions a little bright-red blood in her motions. The pain was not constant, but came on every now and again ; and she generally noticed that it was most severe when her belly became swollen ; so acute was it on these occasions that it would, as she said, " double her up." For about three months her symptoms all abated and she rarely suffered from pain. But six months prior to her admission to hospital there was a reappearance of her old symptoms, the only difference being that the pain was situated higher up, just above the umbilicus. By regulating her bowels with aperients she was able to get fairly good movements and lessen her attacks of pain. For the last three months she had been losing flesh, and noticed that her abdomen frequently became much distended. On admission to the infirmary she appeared as a fairly nourished woman, of sallow complexion, and with a clean moist tongue. Her appetite was good and she digested

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her food well. An examination of the abdomen presented a rather striking appearance. Below the costal margin the abdomen seemed as if constricted, and both flanks were flattened; but the central portion presented a uniform distended appearance. No indication of peristalsis existed, and palpation of the projecting region elicited nothing—no tenderness, rigidity or resistance; and it was tympanitic on percussion. The patient was sent to me by Dr. Mackinlay, of Newton Mearns, as a case of intestinal obstruction. Although the patient had had no attacks of complete obstruction, I had no doubt in my own mind, from the past history of her illness, that she was in all probability suffering from obstruction in some part of the small intestine, but where there were no sufficient indications to suggest. I operated on April 12, 1904. On opening the abdomen, distended coils of small intestine at once presented, and on withdrawing these an involved part of the gut was encountered low down in the ileum. Some three or four strictures existed comparatively close together, and these were removed by excising about eighteen inches of the intestine. A further search revealed another stricture about three inches from the ileo-cæcal valve; this was treated by enteroplasty—the bowel being divided longitudinally through the stricture and united transversely. On opening up the piece of gut removed it was seen that the strictures were not so much of the tight, narrow cicatricial kind, but the result of greatly thickened and infiltrated walls, the inner surfaces appearing as if ulcerated. This applied also to the stricture which was divided and not excised, close

to the cæcum.   The mesenteric glands were also much enlarged.   The patient made an uninterrupted recovery, and when last heard of was quite well. There can be little doubt that the period of improvement, which lasted for about three months, when there was an absence of pain, must have been due to some temporary lessening of the swelling connected with the tubercular process.   Why the pain should have shifted its position from the lower part of the abdomen, where it existed during the earlier stages of the disease, to the upper or umbilical part at a later stage, it is difficult to explain.

It not unfrequently happens that patients suffering from incomplete obstruction of the small bowel are conscious of their pains being increased after taking certain articles of diet.   If indigestible, they may produce a temporary block of the narrowed channel; or, being of an irritating character, induce an augmented peristalsis.

Peristalsis is not usually visible in the small intestine, unless the case is somewhat prolonged in its history and the abdominal parietes thin. It can sometimes be produced by palpation, and the characteristic cramp-like pains invoked. Tenderness is rarely present in any form of small intestine disease, and when present usually indicates that the peritoneal surfaces have become inflamed.

Large Intestine.—Though, as it has already been said, it is often difficult, if not impossible, to distinguish between the pains arising from diseases of the small and large intestine respectively, it is probable that of these two sections of the canal the larger is more frequently the source of pain.

It may be because of its anatomically more fixed relationships, or because it occupies a position in closer contact with the abdominal parietes. By reason of this proximity to the surface it can be more easily palpated; and hence any seat of disease digitally pressed upon.

The nerve-supply, as just mentioned in connection with the small intestine, is mostly through the superior mesenteric plexus; that is to say, this plexus supplies the cæcum, ascending and transverse colon, while the descending colon and the sigmoid flexure are supplied by the inferior mesenteric plexus. Referred pains, when they occur, are felt over the abdomen, corresponding more or less to the ninth, tenth, eleventh, and possibly twelfth dorsal areas (Head). In certain affections of the descending colon and sigmoid, and more particularly in chronic catarrhal inflammation of the latter, Treves* has observed in several cases a pain which is often referred to a spot to the left of the umbilicus. Colitis, whether simple or ulcerative, is almost always associated with pain, which is very variable in its manifestations. It seems to be most frequently invoked by distension of the canal with flatus, and as the formation of gas appears to be a concomitant, and possibly a direct result of the disease, the suffering is often very distressing. In character these pains may be cramp- or gripe-like, cutting, burning, boring, a sense of rawness, gnawing, occurring sometimes in spasms, and often immediately relieved by the passage of flatus or of irritating contents. In a case of mucous colitis under my care, the patient

* "Intestinal Obstruction" (Revised Edition, 1899), p. 297.

always knew when mucus was collecting, it might
be after a week or ten days' freedom from pain ;
but intermitting griping pains would come on, and
relief only follow on the discharge of the mucus.
The most confirmatory evidence of involvement
of the large bowel is the tenderness or pain which
can be invoked by deep palpation of the gut. Where
the intestine is inflamed from the cæcum to the
sigmoid, a complete mapping out of the part can be
made by pressure exercised along the anatomical
course of the canal.   When pain can only be elicited
at certain points, it is probable the affection is
itself localised.   And when, as not infrequently
happens, tenderness is limited to the cæcal region,
owing to the exclusive implication of this segment,
confusion is apt to arise between cæcitis, or ulcera-
tion of the cæcum, and appendicitis.

Obstruction from any cause arising in the large
bowel gives origin to a train of symptoms, among
which pain is very distinctive.   What has been said
of a similar condition in the small intestine might
be said with greater force here, for the pains arising
in incomplete occlusion are possibly more marked
than in the other case.   In the large bowel, the
consistency of the fæces is such that greater difficulty
is encountered in their passage through any narrowed
segment of the canal; and long before the calibre
has been reduced to any very appreciable extent,
the patient will have suffered from time to time of
griping pains coupled with an amount of distension
and difficulty in defæcation seldom met with in the
small intestine.   The peculiarity of these griping
pains is that the patient is sometimes conscious of

their beginning at a certain spot, and then working in a " screw-like " fashion up to another spot, where they end. Relief also is frequently obtained by a sense of something giving way at this latter spot; and if, as often happens, there has been an uncomfortably distended condition of the abdomen, this subsides, and a passage of flatus, or an evacuation of fæces, explains the probable cause of the attack of pain.

The question of diagnosing the exact seat of disease in the colon is in some cases possible. In the first place, the patient may himself be able to correctly localise it, but more reliable is the production of pain by direct pressure upon the involved region. As is well known, there is frequently some inflammation or even ulceration proximal to the stricture or seat of obstruction, and if this be situated at some accessible spot it is extremely probable that deep pressure upon it will cause pain. There is, however, I believe, a fallacy which may be committed in certain cases of eliciting pain by pressure on a part of the colon distant from that which is involved in the disease. Thus, in obstruction, say at the hepatic flexure, due to malignant disease, the bowel proximal to this becomes distended with solid fæces. If deep pressure be made upon the cæcum so as to force the bowel wall upon its solid and perchance hardened contents, distinct pain can be elicited. I have even known a case where strong flexure of the thigh upon the abdomen also caused deep cæcal pain. That no other cause except a packed cæcum could explain this, was proved by a thorough exploratory operation of the right iliac

region, when nothing in the appendix or parts around could be detected; nor on incision of the cæcum could anything be found abnormal within, except the mass of hardened fæces.   I think it not improbable that in some of these supposed puzzling cases, where a stricture of the sigmoid has existed in the left iliac fossa, with pain only in the right fossa, the explanation is to be found in some such way; and the more likely also is this to be the case, when it is remembered that, in any case of chronic obstruction of the large bowel, the most frequent seat for inflammation and ulceration is in the cæcum.

When only slight pressure upon any spot over the course of the large bowel causes acute pain, and still further, when deep pressure cannot be tolerated, it may generally be regarded as indicating some inflammatory mischief which has extended beyond the direct limits of the gut.   Coupled, however, with this, there will almost certainly be other symptoms, as strongly (if not more) suggestive of the true state of matters.

Sudden complete obstruction is followed by acute umbilical pain indistinguishable from that arising from similar causes in the case of the small gut. Rarely is pain caused by any gentle pressure upon the abdomen; on the other hand, it often gives some relief.

It should be noted, in connection with the acute pain which follows upon acute obstruction either of the small or large intestine, that its gradual diminution or disappearance in no way indicates any subsidence in the gravity of the condition. On the other hand, it may be taken sometimes to

denote the passage of the patient into a more critical
and even fatal stage of the complaint. If, therefore,
with the subsidence of the pain there is not a very
marked general improvement in all other respects—
in pulse more particularly—the medical attendant
may have just reason to feel some alarm.

Ross refers to a pain in the back, to which atten-
tion was originally drawn by Sir James Sawyer,*
the result of a loaded colon. Inasmuch as the con-
dition is usually associated with certain digestive
disorders, it seems more likely that this form of
" back-ache " may have its origin from other causes.
Chronic constipation is common, and the amount of
loading which the large intestine undergoes in cases
where defæcation may, as an habitual practice, not
take place for definite intervals of several days, should
render the appearance of this symptom frequent.
Such, however, does not appear to be the case.

Appendix.—In discussing the subject of pain as it
occurs in connection with affections of the vermiform
appendix, I propose to deal with it first from the acute
aspect and then from the more chronic side of so-called
appendicular colic. The appendix is supplied, like
adjoining portions of the small and large intestine,
from the superior mesenteric plexus, hence referred
or reflected pains will be through this plexus, and
nerves from the the ninth, tenth, and eleventh and
possibly twelfth dorsal segments. When, then, from
any acute stimulating cause pain is suddenly excited,
the locality of the sympathetic pains will be in the
peripheral distribution of these nerves, and clinically
we usually find it to be first felt in the epigastric

* *Lancet*, 1887, vol. i. p. 17.

or umbilical region.   As soon as the first shock is
over, the locality of the pain passes to the seat of
the appendix itself, and we find the patient complain-
ing then of pain in the right iliac fossa.

There are many exceptions and variations to this
otherwise typical course of the symptoms.   Either
from the situation of the appendix or from the
nature of the initial attack the pain may be felt
first in the region of the appendix itself, and never
at any other place.   And in speaking of the region
of the appendix it must be remembered that this
does not necessarily imply the right iliac fossa.
In the process of development the cæcum having
retired from the umbilicus into the abdomen, is at
first entirely to the left of the convolutions of the
small intestines.   It subsequently crosses beneath
the umbilicus to just below the liver, from which
point it descends to its normal position in the right
iliac fossa.   Should, from any cause, the cæcum
be arrested in its progress, the appendix would in
consequence be situated at a point above, and even
to the left of the middle line.   The clinical result
of such abnormal position would be that the deep-
seated pain of an acute appendicitis would be
located at that particular spot where the appendix
lay.   Another anatomical point has also to be con-
sidered in regard to the localisation of pain.   While
the point of attachment of the base of the appendix
to the cæcum may be, and probably is, pretty con-
stant, on the inner side of the cæcum, its body
and apex may be located in various situations.
Thus, J. D. Bryant,* in making a special investigation

* " Annals of Surgery," vol. xvii. p. 164.

into this particular point, found, out of one hundred
and forty-four cases, that the appendix was directed
inwards in thirty-one; behind the cæcum in twenty-
eight; downward and inward in twenty-three;
into the true pelvis in seventeen; and the remainder
in various other directions. There is no doubt
that this anatomical variation in the position
of the organ serves to explain the differences
that are sometimes met with. I have had cases
where the patient's pain has been located more
towards the back than the front, that is to say,
in the loin; and in these I have found that the
appendix has been retrocæcal and apparently extra-
peritoneal. That the seat of most acute pain,
especially on pressure, is at McBurney's point, is
probably explained by the fact that it is the most
constant seat of the junction of the base of the
appendix with the cæcum.

Neither the acuteness nor the character of the
initial pain can be said to be truly indicative of the
relative gravity of the attack. In the first place,
we do not know what really starts the pain. It is
supposed that it only occurs when the peritoneal
surface becomes involved; and, in other words, it
means that perforation is commencing, and that the
serous surface is becoming exposed to the irritating
contact of the virulent septic contents of the canal.
If this is so, it is not difficult to understand why
there should be such variations in the primary
intensity of the attack; for there must be every
degree of infectiveness in the exciting material;
and there must also be great differences in the con-
dition of the serous or peritoneal lining at the time

of invasion.   It is probable, with such reasoning,
that when the peritoneal tissue is perfectly healthy—
when there has been no slow inflammatory invasion
with possibly the formation of adhesions—that the
pain may be most acute.   And if, perchance, the
appendix is so placed as to be comparatively free in
the general peritoneal cavity, the acute onset may
mark an extremely grave, if not fatal, issue.   But
there is the equal, if not numerically greater, chance
that it may not be so placed, its situation being
such that a neighbouring coil of intestine or a piece of
omentum or mesentery becomes glued to the affected
spot, and so the unseen mischief is avoided; and the
attack subsides without further immediate danger.

While this initial pain usually manifests itself first
in the epigastric or umbilical region, and secondly in
the right iliac fossa, it is sometimes referred to the
left iliac fossa, and cases occasionally occur where it
spreads more or less over the whole abdomen.   Now
this may mean one of two things—either that a general
peritonitis is commencing, or that the "reflected" or
"referred" pain has become much wider in its dif-
fusion; instead of only taking the ninth nerve it has
implicated the tenth and eleventh, and possibly the
twelfth also, so that the pain becomes diffused over
the whole abdomen.   I think that must be the explan-
ation of those cases where the gravity of the other
symptoms does not seem in accordance with the
general condition of the patient.   These cases, as a
rule, get well, even if not operated upon, and unless
other reasons demand, do not call for that urgent
operative intervention so necessary in cases of
peritonitis.   However, I wish to be guarded in what

I have said about these cases, as it may sometimes
be, clinically, too fine a distinction to draw between
a case of commencing general peritonitis and one
in which there is merely a more diffuse distribution
of abdominal pain and tenderness. In these cases,
therefore, as in all abdominal crises, it is safer, I
believe, when in doubt, to operate than to wait.
In illustration of cases where extreme gravity
co-exists with comparatively slight initial pain, gan-
grenous appendicitis may be instanced. Symptoms
of toxæmia rapidly appear, and probably numb the
nervous system to the sense of acute pain.

I now wish to allude to the palpation of these acute
cases. In passing the palmar surface of the extended
hand over the abdomen in cases where the appendix is
normally placed, tenderness will be felt as the fingers
approach the right iliac fossa. In some instances
the sensitiveness of the skin is extreme, and would
seem to imply that, in addition to the referred pain,
the appendix must lie close to the abdominal wall, and
the parietal peritoneum be involved in the inflamed
area. Any attempt at deep pressure will not only
cause increased pain, but will be checked by the
involuntary contraction or rigidity of the over-
lying muscles. When these same symptoms are
invoked by palpation at other places in which it
is anatomically likely that the appendix may be
situated, the possibility of its being the cause of
the pain must be remembered. When palpation
of the abdomen at some distance from the seat of
disease causes pain, it may either indicate perito-
nitis, or the dragging of adhesions connected with,
or the pressure of neighbouring parts upon, the

inflamed locality.   After the second or third day,
and often earlier, all local tenderness and pain should
commence to subside if the case is going to quiet
down.   If, on the other hand, palpation seems to
become less tolerated, there is the possibility of pus
formation.   But these stages in the disease will be
determined by other manifestations than those
solely evidenced by pain : temperature, pulse,
swelling, and the patient's general appearance, will
all lend their aid towards correctly estimating the
gravity of the possible complications.   It is, no doubt,
possible in some cases to locate the position of the
appendix by palpation.   Thus, when there is greater
tenderness by pressure in the loin, it is probable
that the appendix is retrocæcal.   Again, when the
rectum or the vagina is digitally examined, the
upward pressure of the point of the finger may
cause acuter pain than is experienced by examining
the iliac fossa ; suggesting thereby that the viscus is
directed downwards into the pelvic cavity.   Another
test of this pelvic situation is the production of pain
in distension either of the bladder or the rectum,
causing in the former case frequency of micturition.
When, however, pain is elicited in this way, it becomes
a matter of carefully taking into consideration all
other factors associated with the case, so as to
differentiate properly between inflammatory affec-
tions of the adnexa, such as the tubes and ovaries.
When the appendix is directed inwards across the
psoas muscle, upon which it rests, and to which it
may through inflammation become to some extent
adherent, the patient may be unable to flex the thigh
upon the abdomen without feeling deep-seated pain.

Appendicular Colic implies, clinically, intermittent attacks of griping pain in the region of the right iliac fossa. Sometimes these attacks can be definitely accounted for by the ingestion of certain more or less indigestible foods, sometimes to the result of over exertion ; frequently, however, no cause can be given. In its widest sense, any pain occurring in this region, unconnected with a rise of temperature and other obvious symptoms distinctive of real disease, is frequently put down as appendicular colic. Originally the term had a supposed specific significance ; it was taken to imply an effort on the part of the appendix to rid itself of a fæcal mass or concretion, much in the same way as the colic of a renal calculus or a gall-stone is produced by the muscular efforts of the ureter or the bile-ducts to expel these objects. This similarity has, however, been much disputed, and with some show of reason. For, in the first place, the circular muscle fibres of the appendicular canal are very few in comparison to those of the ureter and the common bile-duct ; and, indeed, by some these fibres are said not infrequently to be absent (Austin Flint*) ; and in the second place, hard concretions, as well as soft putty-like masses, are so frequently found lodged in the canal, in patients who, during their life, have never suffered from pains suggestive of their existence.

Since operative intervention has become so frequent in these cases of recurring pain in the appendix region, other and more likely explanations are forthcoming, and there can be little doubt now

* "Text-book on Human Physiology," 1888, p. 258.

that these are quite sufficient to account for the origin and character of the trouble.

There are certain developmental and anatomical considerations which seem to throw some light on the matter. It is known that the appendicular canal tends to close as life advances. Ribbert* in his investigations found the canal patent throughout in early life, a free communication existing with the cavity of the cæcum. In later life, between the tenth and thirteenth years, he found that 14 per cent. of the cases examined presented partial occlusion ; and between the sixtieth and eightieth years as many as 55.5 per cent. Thus it is easy to understand how, in this process of closure, any portion of the canal may become narrowed, or, in other words, a stricture be formed. Now, inasmuch as the lining wall of the appendix is a secreting layer, some of the viscid secretion gets pent up distally to the stricture, and so distending the part abnormally, causes the pain, which is only relieved by some of the material being forced through the narrowed channel. It is, of course, possible that some of these strictures may be due to the cicatrising of an ulcer, which may only too easily form in an organ that is supposed by some to be undergoing retrogression rather than being functionally active. But, however produced, it is certainly the only lesion detectable in some of those cases where, as pre-existing symptoms, nothing more than vague intermittent attacks of pain in the region were manifest.

There is another anatomical condition which I believe may also serve to explain some of these cases,

* Virchow's " Archiv," 1893, Bd. cxxxii. p. 66.

and that is, the length of attachment of the mesentery to the appendix. Considerable variations are met with both in the extent of the margin of the appendix fixed by its mesentery and the length of the same. It would seem that, when the meso-appendix extends only to half the length of the organ, there is a possible risk of the distal portion becoming sharply flexed upon the proximal ; and this same kinking may also happen when there is a want of uniformity in the length of the mesentery at its attachment at one part as compared with that at another. It is difficult to explain this acute bending of the organ in so many cases, except that it depends upon some such disposition of the parts as described. But, however produced, the effect is much the same as if the canal were narrowed by internal constriction. The secretion of the distal portion of the tube is no longer able to escape, and accumulating, hyper-distends the canal, causes pain, and may lead to inflammation and adhesion. I have been struck with the number of cases that I have met with where either the canal was strictured, or else there was a sharp bend or kink with distension of the distal segment. It is quite possible, and indeed probable, that when a concretion happens to be present distal to the seat of obstruction, the symptoms may be considerably augmented ; but that its presence is not necessary for the production of colic is abundantly shown by the frequency with which these pains are encountered, and yet no concretion is found.

That contractions of the appendix do take place is sufficiently suggested by the slight amount of

hypertrophy of the muscular tissue detected micro-scopically in some of these cases of hyper-distension ; and further, it is not possible otherwise to explain the rounded shape and smaller outline of the fæcal concretions and putty-like masses found in the canal, except by assuming that they have been constantly rolled round and round. I believe, however, that these recurrent colicky pains associated with the appendix are more likely to be explained in the way that I have ventured to suggest, that is, by hyper-distension and mild attacks of inflammation, than by the contractions of the muscle tissue in its efforts to get rid of any irritating contents within the canal.

Rectum.—The rectum is but partially an ab-dominal viscus, in the sense that only the upper four inches or so are within the peritoneal cavity. The nerve-supply at the upper part is from the inferior mesenteric plexus ; but lower down the supply is from the hæmorrhoidal plexuses, derivatives of the pelvic plexuses. Sensory fibres are derived from the second, third and fourth sacral nerves, except those to the anus. The rectum proper is not the seat of much pain in the earlier stages of disease ; in the latest phases, however, it becomes severely affected. Thus, while the smallest ulcer will give rise at the anus to the acutest pain, advanced de-struction of tissue will take place higher up before even discomfort may be experienced. When pain from ulceration of the rectum does manifest itself, it may be both local and referred. A sense of aching, heat or burning is felt in the part itself ; while move-ment of the bowels may be accompanied with

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griping pain across the lower part of the abdomen.
When tenderness develops over the abdomen in
rectal disease it generally indicates commencing
peritonitis.

Malignant ulceration frequently advances to a
considerable extent before pain becomes a marked
feature. When, however, pain does commence, it
usually continues to increase, and becomes one of
the most distressing and intractable symptoms of
the disease. This arises not so much from the in-
volvement of the bowel itself, as from the invasion
of neighbouring parts, and more particularly the
sacral plexus. Pains then become referred to the
back of the sacrum and down the thighs, and are
often of a most wearing and agonising character.

In *stricture* of the rectum the pains are more
frequently referred than local. The distension of
the gut proximal to the seat of obstruction produces
a train of symptoms resembling those of a similar
lesion occurring in the large bowel. The griping
pains will be felt in the abdomen sometimes as high
as the epigastrium. Other pains are referred to
the lower part of the back, to the penis, the peri-
neum, and down the buttocks and thighs.

There are other vague pains connected with the
rectum, which appear to be pains referred to that
region rather than arising from any actual organic
disease of the part. They are sometimes quite acute
in character, described as sharp or stabbing, at other
times only of such a nature as to be sufficient to
constantly keep the patient's mind occupied with
the part. These pains are sometimes met with in
diseases of neighbouring organs, such as the uterus,

ovary, prostate, bladder, and other parts.   Another source is certain affections of the nervous system, as epilepsy, locomotor ataxy, insanity, neuralgia, and hysteria.   When, therefore, a careful examination of the rectum can reveal no cause for the pain which is complained of, other sources for its origin must be sought in the organs and diseases above indicated.

Neuralgia of the rectum, as a disease or functional derangement of the canal *per se*, is doubtful, as pains of this character occurring in the region, are, as already indicated, probably merely symptomatic of mischief elsewhere.

Digital examination invariably causes pain, whether the condition be one of simple proctitis or inflammation, or whether there be definite ulceration. Except with the anus, where the pain produced is extremely severe, the patient cannot localise the seat of the disease in the rectum proper.

CHAPTER VIII

PAIN IN AFFECTIONS OF THE LIVER, BILE-DUCTS, AND PANCREAS.

Liver.—For a full description of the nerve-supply of the liver, reference should be made to the chapter on the nerve-supply of the viscera (p. 31). It may, however, be briefly repeated here that the sensory nerves to the organ are derived from the seventh, eighth, ninth and tenth dorsal spinal segments, with possibly also fibres from the sixth.

Writing as I am from the standpoint of a surgeon, it is naturally with some trepidation that I venture into a sphere, which is often considered exclusively that of the physician. Discussing, however, such a symptom as pain, no line of demarcation can be drawn between affections which are usually considered medical and those it is customary to regard as surgical. The possible significance of pain, wherever it occurs, must be properly appreciated as much by the surgeon as by the physician; although the correct interpretation of the symptoms generally, in order to establish a diagnosis, may be expected more from the one than the other. It is, however, for the general practitioner that I am writing; and for him it is important that nothing should be omitted, from whatever standpoint regarded, which would assist in casting the necessary

light upon every kind of disease with which he may be confronted. For I repeat again, it is to his diagnostic skill in the early recognition of certain significant manifestations, that we look for those opportunities of dealing, more particularly with abdominal diseases, at a period when permanent good can often alone be effected.

In dealing with diseases of the liver, Murchison, in his classical work on the subject, considered them from two aspects—first, from the point of view of enlargement ; and secondly, from that of contraction. In describing enlargements of the liver, he primarily divides them into two classes—those that were *pain-less,* and those that were *painful.* The painless enlargements include amyloid liver, fatty liver, hydatid tumour of the liver, and simple hypertrophy. While among enlargements of a painful nature are, congestion, catarrh of the bile-ducts, obstruction of the common duct and retention of bile, interstitial hepatitis, pyæmic abscesses, tropical abscess, cancer, and certain other rare affections, such as tubercle, sarcoma, &c.

Now, while several of these conditions have pains which may to some extent be regarded as peculiar to them, there are a few general considerations concerning the situation and character of hepatic pains which may be primarily referred to. In the first place, the somatic pains, that is, those that are referred to the body surface, are brought about, in their deep connections, through the right phrenic nerve and the right splanchnic nerves. Thus through the phrenic, pain is felt at the shoulder-tip, while through the splanchnics, it is felt at the inferior

angle of the right scapular, extending sometimes
across the spine to the opposite side.   More rarely
pain is felt in the epigastric region.   According to
Head, the tenderness appears over the areas supplied
by the eighth, ninth and tenth dorsal segments of
the right side (*see* Figs. 8 to 11).   It will be noted, as
regards hepatic pains, that they nearly always radiate
upwards, rarely downwards.   In describing the pains
associated with the enlargements of the liver above
enumerated, I shall quote from Murchison's Clinical
Lectures on Hepatic Diseases.

In *congestion* of the liver, " The patient complains
of a feeling of tightness or painful distension in the
region of the liver, and there is more or less—but
rarely very acute—tenderness on pressure below
the margin of the ribs.   The pain and feeling of
uneasiness may, in consequence of the connection
of the subclavian nerve with the phrenic, stretch
up to the right shoulder, and they are almost always
increased after meals, or by lying on the left side.
In the latter sense there is usually a feeling of dragging
or weight in the hepatic region.   The patient con-
sequently sleeps for the most part on his back or
on his side."

In *pyæmic abscesses* " pain and tenderness are
always present.   They are often among the first
symptoms noted, and are usually acute in conse-
quence of some of the abscesses being near the surface
of the liver, and of the inflammatory action being pro-
pagated from them to the superimposed peritoneum.
The pain is often increased by coughing or by a long
inspiration, so that in consequence the respirations
are quick and short, and mainly thoracic."

In *tropical abscess* " pain and tenderness are very often absent. Pain, when present, is dull and heavy, and not of that acute character, in the first instance at all events, so common in the pyæmic abscess. This is because the abscess is usually at first in the interior of the liver. The pain only becomes acute, like that of pleurisy, and the tenderness great, when the matter approaches the surface of the liver and excites perihepatitis or stretches the integuments. Thus it is that acute pain often marks the last stage, instead of the commencement, of the morbid process. Some cases are remarkably latent, as far as the pain is concerned, throughout their whole course; while in others pain is only produced when the patient takes a long breath, and at the same time pressure is made below the margin of the ribs or on the lower end of the sternum. A sympathetic pain in the right shoulder is not uncommon, especially when the abscess is situated on the convex surface of the right lobe, but in most cases it is absent. The presence of pain in the shoulder will undoubtedly increase, although its absence will not diminish the importance of other symptoms."

In *hepatic carcinoma* the " liver is very often painful and tender on pressure, and the pain radiates to the shoulder, back and loins. At first there may only be a feeling of weight and uneasiness in the right hypochondrium, but after a time there are paroxysms of lancinating pain, awakening the patient at night, and acute tenderness ; and both are particularly severe in cases where the growth is rapid, or where, as often happens, there is inflam-

mation of the superimposed peritoneum. The tenderness is usually most marked over the prominent nodules. But many cases of cancerous liver are met with in which there is little or no pain from first to last."

Under the class of contracted livers, Murchison includes simple atrophy, acute atrophy, and chronic atrophy.

In *acute* or *yellow atrophy* " pain at the epigastrium and in the region of the liver is present in most cases. This pain often comes on spontaneously, and can almost always be elicited by pressure, even when the patient is almost unconscious. There is rarely, however, any tympanitic distension of the abdomen unless there be concurrent peritonitis, in which case the pain and tenderness may be acute."

In *chronic atrophy* or *cirrhosis* " pain in the region of the liver is not a prominent symptom. In the early stage there is sometimes a dull heavy pain with some tenderness in the right hypochondrium arising from congestion, and throughout the disease there may be acute pain and tenderness of a temporary nature, resulting from intercurrent attacks of perihepatitis, but in the intervals of these attacks there is but little pain or tenderness in the region of the liver."

Gall-bladder.—Although affections of the gall-bladder are mostly associated with those of the liver or the ducts, there are a few diseases in which it appears to be primarily and independently involved. Thus it may be the seat of inflammation of some kind, or it may be the centre of a new growth.

A viscus of limited size, and with walls of muscular tissue, pain in it may be caused on the one hand through over distension, and on the other by exaggerated muscular action.

Deep-seated pain is felt in the region of the viscus, that is to say, at the upper and anterior part of the right hypochondrium ; but the referred pains may reach forward to the epigastrium and back to the right scapular region. As depicted by Head, they are principally manifested in the area of distribution of the eighth dorsal segment (*see* Figs. 8 to 11).

In *inflammatory* conditions such as simple catarrh, empyema, and acute phlegmonous cholecystitis, considerable tenderness is experienced by pressure over the gall-bladder. Mayo Robson* localises a specially tender spot " at the junction of the upper two-thirds with the lower third of a line drawn from the ninth rib to the umbilicus." The pains associated with exaggerated efforts on the part of the viscus to rid itself of irritating contents, such as gall-stones or inspissated bile, give rise to spasmodic cramp-like pains often indistinguishable from those produced under similar circumstances by the ducts. In perforation or rupture of the gall-bladder through ulceration or other inflammatory cause, acute pain sets in, similar in situation and character to that which occurs in perforations of other viscera; and as the peritonitis extends so do the pains, and tenderness becomes more diffuse over the whole abdomen.

As a practical point of considerable importance, it should be noted that recurring attacks of pain

* *Brit. Med. Journal*, 1897, vol. i. p. 643.

in the region of the gall-bladder associated with
tenderness more or less acute, and especially also
if accompanied with a little fever, and perhaps
jaundice, probably indicate a localised peritonitis
set up by gall-stones. If these are allowed to
continue without operative intervention, one or
more of many troublesome sequelæ may result.
Abscess may form and cause either external or
internal fistulæ; adhesions may lead to serious
permanent obstruction of the bile-ducts, the duode-
num or the pylorus; and even more serious troubles
than these may ensue, such as perforation into the
general peritoneal cavity, and pyæmia.

The pains associated with new growths are at
first inappreciable, but, as the tumour enlarges, mere
discomfort changes to real pain, felt at first in the
region of the growth, but later, it may be, in the
epigastrium, and round to the right infra-scapular
region.

It may, in conclusion, be added that the simple
presence of gall-stones in the gall-bladder is consistent
with the entire absence of all pain. Indeed, the
viscus may be tightly packed with them, but not the
slightest discomfort experienced. It is only when
from some cause they become a source of irritation,
excite inflammation, distend the viscus, and lead to
powerful and painful contractions of its walls, that
suffering ensues.

Bile-ducts.—While the ducts may themselves
be the seat of certain diseases—inflammatory and
malignant—it is their connection with gall-stones
that renders them of special interest in the present
connection. Indeed it is more usual to speak of

the gall-stones as the primary disease from which
the patient is suffering.

It is probable that many of the initial attacks of
pain connected with gall-stones are due to their
entrance into and passage through the cystic duct.
Later the pains may be connected with the stones
in the common duct. It must, however, be remem-
bered that stones may descend from the liver into
the ducts, and in some instances form in the ducts
themselves. It is doubtful whether by pain alone
it is possible, with any amount of exactness, to locate
the position of the stone, whether it is in the hepatic,
cystic, or common duct, and if in the common duct,
whether high up or low down in the ampulla of
Vater.

While most medical men are familiar with the
character and situation of the pain in a typical
case of biliary colic, it is occasionally somewhat
irregular in its manifestation, and for this reason,
therefore, I shall quote from one whose extensive
experience in this connection renders him specially
well qualified to speak; I mean Mr. Mayo Robson.
In the third edition of his recent work on the
" Diseases of the Gall-Bladder and Bile-Ducts "
(p. 224) he states : " For the most part the patient
complains of pain under the right costal margin,
or in the epigastrium, whence it radiates over the
abdomen, and to the right subscapular region; but
in some cases the pain radiates to the left shoulder.
These attacks come suddenly when the patient is
quite well, and usually end by causing nausea or
an attack of vomiting. The vomiting leads to
relaxation of the duct, and if the gall-stone be small

it may pass on and thus end the attack. The seizures come on without apparent cause, although at times they may appear to be brought on by exertion, or by taking food. Not infrequently, after an attack has passed off, a dull aching is felt in the region of the gall-bladder for some time, perhaps until another seizure. In several cases we have noticed the pain to begin on the left side over the stomach, and in these we have always found adhesion of the stomach to the gall-bladder or bile-ducts.

" The pains may be irregular at times, simulating angina pectoris, and being almost limited to the precordial region or epigastric, simulating ulcer of the stomach; or genito-crural, and resembling renal calculus; the absence of other cardiac, stomach or renal symptoms, and the presence of tenderness over the gall-bladder or in the line between the umbilicus and the ninth costal cartilage, usually enable a diagnosis to be made.

" It is not uncommon for the pain to commence in the epigastrium, and to radiate thence all over the abdomen, especially into both hypochondriac regions; it may then pass through to the mid-scapular region, and even pass up to the head and neck, or down to the loins."

There is considerable variation both as to the intensity and the duration of the pain. In its worst form it is agonising, doubling the patient up in his effort to get relief. In point of time the pain may last for a few hours only, or may extend over several days.

Pain which lingers after a serious attack has

more or less passed away usually indicates a localised peritonitis, and in this connection Mayo Robson states : " We believe that nearly every serious attack of biliary colic is accompanied by adhesive peritonitis, as experience shows that adhesions are found practically in all cases where there have been characteristic seizures."

When the stones are in the common duct " the frequent attacks of pain are usually less severe than when they are in the cystic duct . . . the pain also is in the epigastric rather than in the right hypo-chondriac region, and passes through to the right dorsal lumbar rather than to the right infra-scapular region, and the tender point is found between the umbilicus and ensiform cartilage, rather than be-tween the ninth costal cartilage and umbilicus, as in ordinary cholelithiasis."

It may be further noted that pains indicative of various complications will arise at later stages when, as the result of the gall-stones, inflammation and ulceration have led to abscess formation in different parts, or to direct perforation into the peritoneal cavity. In the latter case symptoms of an acute general peritonitis will be set up.

Pancreas.—Surgery has done much of recent years to throw light upon certain diseases of the pancreas, and pains that had hitherto been often ascribed to the stomach or liver are now known to arise from affections of this organ. As is the case with other intra-abdominal viscera, the pancreas may be attacked by inflammation or by new growth, both innocent and malignant.

In describing the pains associated with inflamma-

tory and other conditions of the viscus, I shall again avail myself of the advanced experience of Mr. Mayo Robson, and quote from the work conjointly edited by him and Mr. B. G. A. Moynihan, on " Diseases of the Pancreas."

In *acute pancreatitis* the disease " is usually ushered in by a pain in the superior abdominal region. . . . The pain may be so severe as to produce syncope or collapse, and though the pain does not quite pass away, it has a tendency to be paroxysmal and to be increased by movement; it is associated with well-marked tenderness, just above the umbilicus or between it and the ensiform cartilage. The pain is soon followed by distension in the superior abdominal region, which may become general, and usually does so in the later stages, and by vomiting, first of food, then of bile. The vomiting may be severe, and each seizure may aggravate the pain, but at times vomiting may not be a prominent symptom. . . . The distension, pain, and tenderness, with rigid recti, prevent an exact examination of the pancreas, which would otherwise be found enlarged."

Under the heading of this form of pancreatitis must also be included *acute hæmorrhagic pancreatitis* and *acute suppurative pancreatitis*. In both the pain will rapidly spread from over the whole abdomen, due to the lighting up of general peritonitis.

In *sub-acute pancreatitis* the pain, although often sudden in its onset, and situated in the epigastrium, is not so acute or so prostrating as in the forms of inflammation just described. It " occurs in

paroxysms, but there is also a constant dull pain in the epigastrium." Tenderness in the epigastric region is well marked.

In *chronic pancreatitis* " the onset may be quite gradual and painless, or may be ushered in by severe pain at the epigastrium, followed by jaundice resembling a gall-stone attack and associated with nausea and vomiting, and perhaps followed by a feeling of chilliness or even a rigor. The pain, however, is not over the gall-bladder, and does not pass around the right side to the subscapular region, but is central and passes backwards to the mid-scapular region, or around the left side, thus resembling stomach rather than gall-bladder pain. The tender spot is usually an inch above the umbilicus in the middle line, and not over the gall-bladder, as in cholelithiasis. When once jaundice has come on, it tends to deepen with each attack, until it becomes continuous and chronic. The paroxysms of pain may be repeated more or less frequently, or there may be no paroxysmal pain, merely a dull ache deeply seated, burning and boring in character. A swelling of the pancreas may sometimes be made out, but as the recti are rigid because of the pain and tenderness in the epigastrium, it can usually only be discovered under anæsthesia."

In *cystic disease* of the pancreas "almost imperceptibly the feelings of discomfort, weight, and fulness in the epigastrium increase. Pain is noticed towards the end of, and for some time after, a meal, and vomiting becomes gradually established as a distressing symptom. To these earlier, less pronounced symptoms, Friedreich has given the name

' Cœliac neuralgia.' The pain is generally confined to the upper half of the abdomen, but it may radiate to the back, especially on the left side, and has been said to strike downwards into the testes. The intensity of the pain is liable to wide variation ; it may resemble that of ' indigestion,' or may be acute and almost intolerable, and suggest intestinal obstruction."

In *cancer* of the pancreas " the earlier symptoms refer almost invariably to disturbances of the digestive organs ; there are loss of appetite, heaviness after meals, feelings of fulness and weight in the epigastrium, heartburn and occasional vomiting. Pain in the epigastrium radiating round one or both sides of the back is sometimes excessive, wearing, almost intolerable. In the lancinating, burning and instantly overwhelming character the pain in certain cases is probably only equalled by that caused by tabes. It is both continuous and intermittent ; the continuous pain is rather a dull, persistent ache ; the intermittent is sudden in onset, apparently causeless, and brief in duration. In one half the cases, at least, the suffering is exquisite, and is not infrequently worse at night. In a certain number of cases pain may be entirely absent."

In *pancreatic calculus*, " the majority of examples experience pain, or at the least a sense of great discomfort, felt in the upper part of the abdomen, generally at or near the middle line, and but rarely, as in Minnich's case, under the left costal margin. The pain frequently comes in sharp colicky attacks, similar to but less severe than those due to gall-

stones.   A sense of soreness or stiffness is noticed for a day or two after the attack.   When the pain is at its height, vomiting, hiccough, rigors, cold sweats, or collapse may be noticed.   After the attack some fragments of stone may be found in the motions (Minnich, Leichtenstern)."

CHAPTER IX

PAIN ·IN AFFECTIONS OF THE URINARY SYSTEM.

THE **kidneys** occupy for all practical purposes the same position on both sides of the abdomen. They are deeply seated in the loins alongside of the bodies of the last dorsal and first three lumbar vertebræ. They rest posteriorly against the quadratus lumborum muscle and to a slight extent upon the psoas of their respective sides. Through the renal plexuses of nerves which supply them, they are brought into close connection with the semilunar ganglia on each side, and therefore with the great solar plexus centrally. It will also be remembered that the renal plexuses receive branches from all the splanchnics and from the first lumbar ganglia. Thus it can be well understood why referred pains should be a special feature in connection with certain diseases of these organs.

The deep-seated pain of renal disease is felt posteriorly just below the costal margin, and the " maximum point " of tenderness is at this point also. According to Head, the kidney is particularly associated with the cutaneous areas of the tenth, and to a less extent those of the eleventh and twelfth dorsal and first lumbar segments (*see* Figs. 8 to 11). The referred pains extend forwards to the abdomen, across to the opposite side, down to the genital

organs, and along the thighs, reaching even some-
times to the feet.

As regards the character of the pains arising in
connection with renal disease, they appear to
possess the greatest variation. From a simple
dull worrying ache there may exist every degree of
intensity up to the acute agonising spasms which
temporarily prostrate the patient. The true de-
termining character of the pain mostly turns upon
the suddenness with which certain changes are
effected in the renal tissue. Thus it may be said
that where distension of the viscus is slow, the pain
may be of the slightest; and, indeed, in many cases
the organ may become greatly increased in size from
various causes, without producing any pain at all.
On the other hand, any acute inflammatory process,
or anything that might block the entrance of the
ureter, and so cause sudden increased tension,
would in most instances be followed by acute pain,
sometimes spasmodic in its appearance. Except,
then, as a means towards localising the organ from
whence the pain arises, the true nature of the
diseases producing it can often be only determined
by the existence of other symptoms. I will, how-
ever, give briefly the pains which may be met
with in special diseases of the kidney, but before
doing so a few other general remarks are needed.
In order to elicit pain by palpation of a diseased
kidney, the colon should be thoroughly cleared by the
administration of aperients. The patient should be
placed in the supine position with the thighs flexed
and the shoulders slightly raised, in order to relax,
as much as possible, the abdominal parietes. The

pressure must be exercised gradually and gently in order to avoid the reflex contraction of the muscles, so easily excited by a two sudden squeeze of the part. Pressure upon a displaced healthy kidney causes a sense of discomfort rather than actual pain ; but if the organ be inflamed from any cause, or enlarged, it may be, from growth, cystic disease, or other cause, the patient will at once wince and complain of pain on palpating it. It may be added that a healthy kidney, situated in its normal position, can rarely be palpated. It occasionally happens, in cases where slight pressure is capable of causing pain, that the contraction of the psoas muscle may evoke it. If the patient be asked to flex the thigh upon the abdomen, the pain when so caused is felt deep down in the right or left hypochondriac region, as the case may be.

It has been recently pointed out by Signorelli * that in cases where the kidney is already in a condition of hypertension, a rhythmical pulsating pain is felt in the loins synchronous with the heart's beat. As each contraction of the heart increases the tension of an organ already abnormally engorged, regular spasmodic attacks of pain are the result. The symptom appears to be one worth noting, as helping sometimes to confirm, what otherwise, from the resemblance to other diseases, might be considered only suggestive.

A point of considerable interest in connection with renal pain, is the fact that disease of one organ may produce symptoms referred to the other, itself

* Epitome, *Brit. Med. Journ.*, June 4, 1904, p. 89.

apparently quite healthy. I should not have ventured this statement in the face of an opinion such as that expressed by so experienced an authority as Mr. Henry Morris, had it not so happened that, some years ago, a very typical example of it occurred in my own practice, and that I have also the support of an equally good authority in Dr. David Newman, of Glasgow. Mr. Morris,* writing upon the subject of " reflex pains " in his work upon " Surgical Diseases of the Kidney and Ureter," says : " I consider the doctrine of reno-renal reflex with an absence of pain in the affected kidney as unproved and unsound, and, if acted upon in practice, likely to lead to very serious and dangerous results." The history of my own case was that of a man aged twenty-eight years, who had complained of a " nagging " pain in the right iliac region, which seemed to him to pass upwards and lodge in his right lumbar region, where it produced a dull sickening sensation. It would linger there for twenty-four hours, causing him during the time to vomit, and making him at the end of the attack feel very weak. He had four exceptionally bad attacks of acute iliac and lumbar pain. Immediately after one of these attacks the urine was found to contain a quantity of albumen and red blood-cells, but no tube casts. I explored the right kidney and passed a catheter down the ureter, but nothing whatever could be detected. The patient had complete suppression of urine after the operation, from which he died on the fourth day. A post-mortem was made. The right kidney appeared perfectly healthy, but the

* Vol. ii. 1901, p. 84.

left one contained a calculus, about the size of a pea, in one of the upper calyces.

Dr. David Newman,* in his work on the " Diagnosis of Surgical Disease of the Kidney," not only expresses his own conviction as to the existence of a reno-renal reflex, but also quotes a case which came under the care of Mr. Edmund Owen, and is in one sense a more striking example than mine, inasmuch as the calculus which was found in the kidney opposite to that in which the pain existed weighed four hundred grains.

I shall now proceed to give some of the pains which may be met with in certain diseases of the kidney, but it must be understood that they in no sense represent what is to be expected in every instance. Renal pain, as has already been indicated, is of a most variable character, and it is quite impossible in many cases to understand why in the same diseases there may be such marked differences in the symptoms manifested.

The following list of diseases may be first given as that in which pain is rarely a symptom of any significance ;   indeed, is rarely present : *amyloid disease, fatty disease, granular kidney,* or *Bright's disease, acute* and *sub-acute chronic nephritis* not passing on to suppuration. But in those which are now to be mentioned pain is often a very distinctive feature.

In *abscess* of the kidney, whether of the multiple form (" surgical kidney ") or solitary, a dull, deep-seated pain is felt in the loins, with considerable tenderness on pressure over the part.

* P. 71.

In *embolism* of the kidney, pain is frequently sudden in its onset. " It is usually of moderate severity, and is felt in the back and loin. It is not so definite in its localisation as that seen in renal colic, but may be confined definitely to one side." *

In *hyperæmia* of the kidney, it is only in the active form that pain is occasionally felt. It exists in the loin, and is only in exceptional circumstances severe. The condition is one which may pass off, or may be the precursor of more serious inflammatory mischief.

In *simple cystic disease* of the kidney " pain may follow the formation of a tumour, and may even, though much more rarely, precede it ; it is of a dull aching character, and gives rise to a sensation of weight limited to the loin and hypochondrium ; at times, especially after much exertion, the pain may be more severe." *

In *polycystic disease* of the kidney, " pain, or a dull aching in the lumbar region, is commonly and early complained of, at first in one side, and later, if the disease becomes bilateral, in both sides. There may be pain referred to the abdomen as well as to the loins. It is of a sickening character, but not severe, except during the movements of the patient or the wandering of the kidney. Whilst resting in bed the pain is either absent or very slight. If the polycystic kidney is also movable, suffering is increased. The pain may be persistent or intermittent, or, being persistent, it may be exacerbated by attacks of great severity. The exacerbations

* Morris : " Surgical Diseases of the Kidney and Ureter," vol. i. 1901, p. 641, *et seq.*

may resemble renal colic, and while they last the swelling may increase and general and urinary symptoms become worse. There may be tenderness on pressure, and in some cases even when only slight pressure is used. In other cases there is only the sense of general discomfort due to the size and weight of the kidney, without any actual pain. Twenty patients out of seventy-eight complained of pain in the loins or in the abdomen." *

In *hydatid disease* of the kidney the existence of pain is very variable, as frequently as not being absent. When present, it may be of the nature of a dull, dragging sensation in the loins. Occasionally it happens that the cyst bursts into the pelvis of the kidney, and the hooklets and daughter-cysts thus set free, sometimes plug the ureter and produce typical attacks of renal colic.

In *hydro-nephrosis* pain is not a marked symptom, except when, from some more complete obstructive cause, the tension is suddenly increased; at most other times it is represented by a discomforting feeling of dragging or weight in the loins. In some cases the sudden onset of pain may indicate a rupture of the hydro-nephrotic sac into the general peritoneal cavity.

In *tubercular kidney* there is but little pain so long as the disease is limited to the parenchyma and the organ has not reached any large size. In the later stages, however, the patient complains of a deep-seated dull aching pain in the loin, more or less constant in character, and undergoing exacerbation, at times when there is some increase of renal

* *Loc. cit.*, Morris, vol. i. p. 657.

tension. If the disease has extended from the renal substance proper into the pelvis, so that there is a free discharge of tubercular material, acute spasmodic attacks of pain occur, often quite indistinguishable from those which result from a renal calculus. Palpation of the lumbar region sometimes elicits tenderness.

In *renal calculus* we have some of the most distinctive pains connected with renal disease, but we have a condition also which is extremely wide and diffuse in its manifestations and in the character of the symptoms produced. In the first place, the peculiarity of the pain depends upon the situation of the calculus, and upon its composition and configuration. A calculus may be so placed that it only occasionally gives rise to slight lumbar pain, and the intervals between the seizures may extend sometimes to years. These cases, however, of so-called quiescent calculi are rather the exception. When, on the other hand, a calculus is free to move to a certain extent, and is exposed to pressure, the pain is likely to be much more severe, and to occur at periods with shorter intervals. The effect of external contour and structure shows itself in the acuter pain felt in the rough hard nodular oxalate of lime calculus, as compared with that experienced in the smoother-surfaced uric acid form ; while the phosphatic calculus is said to cause " great and unremitting pain attended with exacerbations."

The size of the calculus has but little to do with the severity of the pain, as often a small hard oxalate stone no larger than a pea, if surrounded with spike-

like projections, will cause as acute pain as will be experienced from many of a much larger size.

One of the most distinct features of calculus in the kidney is *renal colic*, a sharp spasmodic pain of variable duration, felt deep in the loin ; taken with other symptoms, such as the passage of blood, vesical irritability, &c., it becomes almost pathognomonic of the disease.

No other organ, possibly, is so fertile in the production of referred or reflex pains, and in no other condition of the kidney are they so frequently met with. Thus the pain of renal calculus may be referred to the opposite kidney region (reno-renal reflex). I have already discussed this "reflex," and will not, therefore, further deal with it (*see* p. 101). Pain is sometimes referred to the bladder, being felt over the hypogastrium, and deeply seated in the organ itself ; during the attack of colic there may be both frequent and painful micturition. In other cases again, the pain may be referred to the testis, and become so acute in this organ as to overshadow any suspicion as to its true origin. In the female, pain is occasionally referred to the uterus and adnexa. As seats of still more distant distribution, pain is felt down the thigh, and in exceptional instances, throughout the whole distribution of the sciatic nerve, that is, to the calf of the leg and the sole of the foot.

There is one other feature worthy of notice, and in itself of some importance in establishing the diagnosis of a suspected calculus, and that is the pain evoked by movement either voluntarily or accidentally. If the kidney region be palpated in such a

way as to disturb the position of a calculus, acute pain may be produced, and this as distinct from simple tenderness of the part on pressure. Again, the patient may find that certain movements produced by walking, riding, driving, and such like, induce attacks of renal colic, and that motion of even a less violent character, such as turning from side to side when reclining, may do the same. It has also been noticed that direct pressure of the kidney by a loaded colon, or by any increase of intra-renal blood pressure, may be the means of calling forth pain.

In *pyelitis* the inflammation which attacks the pelvis of the kidney is frequently associated with pus in the substance of the organ (pyelo-nephritis) as well ; and as the disease often owes its origin to inflammation ascending up the ureter from the bladder, the symptoms may be somewhat diffuse. Pain, however, of a dull, aching character may be felt in the loin, and any deep pressure reveals marked tenderness in proportion to the extent of the disease. When the pus within the pelvis temporarily blocks the ureter, sharp attacks of acute pain are felt.

In *perinephritic abscess* the pain partakes more or less of the typical renal type; that is to say, there is the deep sense of pain in the loins, either of a dull, aching character, or sharper and more acute, together with considerable tenderness on palpation of the region. Referred pains are also frequently present, and may be felt in the hypogastrium, in the penis or testis, and extending to the groin and down the thigh. The close relationship of the psoas muscle to the kidney renders involvement of this a not infrequent occurrence ; when, as happens under the

present conditions, the inflammatory extension around the organ may even invade the muscle tissue. In consequence of this association or actual involvement, the patient avoids the painful effects produced by any contraction of the muscle, and so will often walk in a bent position to secure immobility of the parts.

In *solid tumours* of the kidney, whether of the innocent or malignant type, pain in the earlier stages of the disease is rarely felt. Their comparatively slow growth allows of extension and invasion of the capsule and parenchyma without producing any marked symptoms. It is only in their later stages that pain of a dull character may be felt ; but before this, other symptoms, as hæmaturia, tumour, &c., will have made themselves sufficiently manifest to indicate the probable nature of the disease.

Nephralgia of the kidney is the occurrence of spasmodic pain of the characteristic renal type, which occasionally attacks the region, but which appears to have no definite organic explanation for its origin. It has not unfrequently happened that the kidney has been explored under the belief that some definite cause permanently existed, but nothing has been found, although the patient became completely relieved. Many causes have been ascribed, such as temporary congestion of the organ, malarial poisons, hysteria, reflex irritation from the stomach or intestines, and in women, disturbances connected with the genital organs.

The **Ureters.**—It is important in the first place to have some idea of the position of the ureter

within the abdomen. According to Morris,* its course is determined by taking a point above " at the intersection of a transverse line between the tips of the twelfth ribs with a vertical line drawn upwards from the junction of the inner and middle thirds of Poupart's ligament," and one below at " the junction of the upper and middle thirds of the line of the common and external iliac arteries, viz., from half an inch below and to the left of the umbilicus to midway between the anterior superior spine of the ilium and the symphysis pubis. A line drawn between these points fairly represents the line of the ureter in the abdomen." Along this line palpation must be employed in order to elicit tenderness and detect any enlargements of the duct. The lower or pelvic portions of the dilated ureters can be palpated through the antero-lateral fornices of the vagina, and in the male through the antero-lateral wall of the rectum just above the vesiculæ seminales. It is doubtful whether through the abdomen, or by way of the vagina or rectum, the normal ureters can be felt.

Another point of clinical interest in the anatomy of the ureters is their close relationship with the psoas muscles, so that contractions of these muscles would be capable of producing pressure upon them, and causing pain in certain diseases. The nerve-supply is particularly abundant, the upper part of the ducts receiving branches from the renal plexuses, lower down from the spermatic or ovarian plexuses, and in the pelvis from the vesical plexuses. It will thus be seen at once how difficult it becomes to

* Morris, *loc. cit.* p. 303.

differentiate between affections of the upper part of
the ureter and disease of the kidney, and between
affections of the lower segment and disease of the
bladder, so far as the symptom pain is concerned.
The referred pains are somewhat wider in their
distribution than in the case of the kidney. Thus,
according to Head, the upper part of the ureter is
associated with the tenth dorsal segment, while the
lower part is in connection with the first lumbar.

The pain, then, which we may expect to appear
in connection with certain affections of the ureters,
will be felt in the abdomen, at the groin, in the penis
or testicle, in the bladder, or in the ovarian region.

In almost all instances the diseases of the ureters are
secondary to affections of the kidney or the bladder;
in other words, diseases commencing in either one
or other of these viscera extend into and involve
the ureters. But to know that a ureter is impli-
cated is to help sometimes in determining the
particular kidney involved. Thus, in tubercular
disease of the kidney or in renal calculus, to detect
distinct involvement of one ureter is to settle,
the often otherwise disputed question, which is
the kidney attacked. The clinical question of most
practical importance in connection with the ureters
is that which concerns the position of a renal calculus
and the existence of stricture or stenosis. Un-
fortunately, pain cannot alone answer it. In both
stone and stricture the same acute spasmodic
attacks occur, varying both in intensity and in fre-
quency; and as regards the position of a stone,
whether it be high up or low down, it is in the large
majority of cases impossible to distinguish between

the pains resulting from a stone in the kidney or from one in the ureter. Pressure through the vaginal wall or the rectum may detect the calculus, and cause acute tenderness, in which case its locality low down near the bladder becomes clear ; but when impacted in the ureter high up—although under exceptionally suitable cases it might be palpated through the abdomen—it is rarely discovered as ureteral, until actually exposed by operation and catheterisation. In some rare cases, where the calculus is impacted in the ureter as it lies over the psoas, contraction of that muscle might cause pain.

Other affections of the ureter, such as tumours, &c., are too rare to need any special reference to the one symptom of pain.

The **Bladder.**—Although the bladder is in many ways an abdominal organ, it plays but a secondary part in the production of abdominal pain. Supplied with nerves from the vesical plexuses, its spinal connections are mostly through branches of the anterior sacral nerves, and by means of these, therefore, the referred pains which arise in connection with vesical disease belong more to parts below than to parts above. When, however, the bladder becomes unduly distended, or through disease extremely sensitive, higher segments in the cord become involved, and pains may be referred to the loins and hypogastric regions through, probably, the eleventh and twelfth dorsal nerves and the first lumbar. These referred abdominal pains are very variable both in intensity and in duration. In acute cystitis they may be of a constant dull aching character, considerably increased in acuteness by distension of the bladder

with urine. Pressure exercised above the pubes elicits tenderness and pain, as does also upward pressure on the anterior wall of the rectum. The diagnosis, however, of diseases of the bladder rests much more upon other symptoms than those manifested by the occasional appearance of pain in the loin or hypogastrium. It is upon such manifestations as the character of the urine; the frequency of micturition; the distribution of pain in the penis, perineum, groin, sacrum, thighs and limbs that most attention must be directed.

The **Prostate.**—Practically an extra-abdominal organ, it is nevertheless sometimes the cause of pain referred to the abdomen. So intimately associated with the neck of the bladder, its nerve-supply is much the same, and in cases of acute inflammatory conditions of the gland it has been known to produce pain and cutaneous tenderness in the right or left loin extending round to the hypogastric region, thus following the distribution of the nerves coming from the tenth and eleventh dorsal segments (Head).

CHAPTER X

PAIN IN AFFECTIONS OF THE MALE AND FEMALE GENERATIVE ORGANS.

THE **Testicles,** although placed outside the abdomen, are in most other respects abdominal organs. They are primarily developed within the abdominal cavity and are sometimes retained there. The nerve-supply is entirely from within the abdomen, being derived from the spermatic plexuses, derivatives of the renal plexuses, and receiving, in their course downwards, connecting branches from the pelvic plexuses. It will thus be seen that the referred pains are likely to be somewhat widely distributed, inasmuch as the sensory fibres of the cord which connect with these plexuses are derived, according to Head, from the tenth, eleventh, and twelfth dorsal segments, and the sacral.

The abdominal pains are most marked in cases of disease of misplaced testes, whether retained in some part of the normal course through which they should have passed to reach the scrotum, or in some position away from this course. One reason of the greater acuteness of pain which usually follows upon acute inflammatory conditions of the organs so mis-placed, is that they are less able to expand than when they are normally situated in the scrotum ; and that they are under greater influences of external

pressure.   The pains arising under these conditions
are most severe in the region of the organ itself,
where the slightest additional pressure by palpation
augments considerably the patient's suffering.   The
referred pains may extend over the whole abdomen,
and partake of a colicky character ; while pain may
be felt in the lower part of the back and downwards
over the thigh.   Certain movements also are liable
to increase the pain and cause it to assume a sharp
cutting character.   When the testes is situated
well within the abdomen, the point of greatest
tenderness on pressure is above and a little to one
side of the pubes.   Taken with the absence of a
testicle in the scrotum, the symptoms may be
regarded as strongly suggesting the source of the
trouble.

In the various diseases which attack the testicle
when situated in its normal position in the scrotum,
there are very few which give rise to pain other than
that localised in the organ itself.   It is, indeed,
almost entirely limited to those affections which are
of the acute inflammatory type.   In these the
referred pains are felt mostly in the iliac fossæ,
loins and back, principally at the lower part.   In
chronic inflammatory states, such as may arise from
specific infections, either gonorrhœal, syphilitic,
or tubercular, and in growths, whether malignant
or innocent, pain is never a feature either locally
in the organ or elsewhere.   What has been said
as regards the testis applies equally to the **epi-
didymis**, for this part receives a nerve-supply
similar to that of the testicle.

As regards affections of the **spermatic cords**, refer-

ence only needs to be made to certain more or less advanced cases of varicocele. Here, as the result either of increased pressure, or on account of the fluctuating weight of the part, the nerves become unduly pressed or dragged upon, with the result that the patient suffers pain of a dull aching or dragging character in the groin and in the lower part of the back.

The **Female Reproductive Organs.**—Before discussing the special pains associated with diseases of the female reproductive organs, a few introductory remarks are necessary. Situated as these organs are within the abdominal cavity : undergoing periodically changes of such functional moment; and endowed with an abundant nerve-supply which places them in relationship with widely situated parts, the symptoms to which they are capable of giving origin—in disease more particularly— may be said to far exceed in character, generalisation and degree, affections of any other viscus or system of viscera. The many aches and pains to which the female organism is subject are too frequently attributed to other causes than to those from which they in reality arise. And further, in not a few instances a wrong interpretation of their significance has led to the adoption of measures, if not actually harmful, at least often useless. Whatever true hysteria may mean, it is certain that referred pains connected with diseases of the uterus and adnexa are frequently explained on the suppositional basis that they are the vague and ill-defined manifestations of this complaint. Equally have these same pains been put down to a so-called neurotic state ; by

which it is meant to imply a general unbalanced
condition of the nervous system, in the sense that the
patient imagines her sufferings, and unduly ex-
aggerates any such that may exist.

But the frequent injustice of these imputations
is better understood, when we regard a little more
minutely, the various factors that are brought into
play in considering the connection and relationships
of these parts. First, there is the all-important
subject of generalisation of pain, that is, the tendency
for pain to become referred to many more, and it
may be distant parts, when from some cause the
vital powers of the system, as a whole, are lowered.
The subject has already been fully dealt with in
chapter vi. But it may be again alluded to here,
for though, as has been discussed, it refers to pain
arising from any diseased viscus, it is much more
frequently met with, and much more likely to be
overlooked and misunderstood, in affections of the
uterus, ovaries, and tubes, than in any other class
of cases. Whatever may be the causes, and they are
doubtless many, which contribute to make women
more liable to debilitating and enervating affections
than men, the general effect is often to render the
spinal, if not the cerebral, nervous system more
irritable and easily excited. The practical result
of this upon the nerve-centres is to make them more
easily transmit influences received, and thus render
more acute the sensations involved. More, how-
ever, than this happens, for one segment of the cord
no longer becomes the sole and exclusive transmitter
of influences from its own afferent to its own efferent
nerves, but the influences are handed on, as it were, to

other segments above and below, so that the efferent nerves of these segments become the transmitters of pain and morbid sensitiveness to various more distant parts of the body.

Anæmia, so common in women, and arising from several different causes, is one of the most prominent among constitutional conditions to lower the resistant powers of the nervous system, so that pains arising from diseases of uterus, ovaries, or tubes are very liable to have a wide area of distribution. Again, the purely functional parts which these three constituents of the reproductive system have to play, are sufficient in themselves sometimes to make the general system, as a whole, more susceptible to organic changes, should they at any time arise. In the same category of predisposing constitutional conditions may be mentioned, neurasthenia, gout, and chronic rheumatism.

Thus it will be seen that, from the point of view of pain, there are many and complicated factors to consider in discussing the subject as it bears upon the reproductive organs, and while it may be possible, and indeed is, to fix upon certain definite manifestations of disease of each special organ, it must be equally understood that the limits may be greatly exceeded; and in all such cases it behoves the diagnostician to examine his patient the more closely, in order to differentiate between what does and what does not belong to the supposed part involved. With these few preliminary, but important, remarks, I now propose to take up each organ individually, and denote those characteristics which, as regards painful manifestations, may be said to

belong to them. It must, however, be borne in mind that the subject is being primarily regarded from the abdominal aspect, and that the pains given in any particular instance must not be considered exhaustive of all those which may appear.

The **Uterus.**—The nerve-supply of the uterus is from fibres which come from the pelvic and ovarian plexuses; these pass mostly to the cervical region, while to the body some branches are supplied direct from the hypogastric plexus. This somewhat widely derived supply brings the uterus through these plexuses into relationship with, according to Head, the eleventh and twelfth dorsal segments above, and the third and fourth sacral below. The cervical canal is more abundantly supplied with sensory fibres than the body of the organ. The cutaneous supply from these spinal segments explains the prevailing referred pains experienced in uterine disease. Thus it is mostly in the lower part of the back, the hypogastrium, and the loins that complaint is made ; while in the pelvis itself sensations are felt often of the nature of a heavy, dragging, or bearing-down pain. Other pains are often present, but these refer more particularly to special diseases, and will now be discussed under their respective heads.

In *dysmenorrhœa* pain is felt in most cases in the hypogastric region, or in one or other iliac region. In other cases it is lumbo-sacral, while in some extreme instances the pains extend up the abdomen as high as the waist, and down one or both legs. The character of the pain is determined mostly by the cause which has given rise to the dysmenorrhœa.

Thus, in the obstructive form of the disease, the powerful contractions of the uterus, in order to expel its contents, cause the so-called *uterine colic*. The attacks of pain in these cases are mostly intermittent. In the neuralgic form the pain is sometimes agonising in its severity, and not infrequently constant; considerable tenderness of the skin is experienced over the lower part of the abdomen. In some rarer conditions of dysmenorrhœa, pain is felt in the intermittent period, and is described as of a spasmodic character occurring in the iliac regions.

In *endometritis* we may for all practical purposes, as regards the symptom of pain, include most forms of inflammation, whether of the acute or chronic kind, and whether involving the cervix or the body of the organ. The acuter the inflammatory process, the more marked, in most cases, the pain produced. The most constant seats for its manifestation are in the back and loins, and the character of the pain, that, frequently, of a constant aching. Anything which tends to increase the congestion of the organ tends also to augment the pain, so that patients frequently suffer more when standing or walking about than in the recumbent position. Within the pelvis there is often the sensation of "weight" or "bearing-down." The passage of a sound, or pressure in vaginal palpation causes acute pain.

The various *displacements of the uterus* call for little notice in regard to the production of abdominal pain. The discomforts to which they give rise are mostly diagnosed on other lines. In *anteversion* the displacement of the fundus forward against the symphysis pubis sometimes causes a dull aching pain

in this region.   Many of the pains connected with versions and flexions of the uterus are, however, secondary, and only due to the diseases which may be set up in the organ itself, or to complications provoked in other viscera—as the bladder or rectum. According to Herman, retroversion more frequently causes pain on the left side than the right, owing to the greater tendency for all referred pains to become manifest on the left side.*

In *myomata* of the uterus, pain, in the early stages of the disease, is an infrequent symptom; it is apparently commoner when the tumours are multiple in the uterine walls than when there is a single tumour, and then is more strictly limited to the organ than referred elsewhere.   The pains which subsequently develop as growth advances are connected more with some disturbance of menstruation — metrorrhagia, menorrhagia and dysmenorrhœa being conditions that cause pain of the character above described, under the heading of dysmenorrhœa.   When the tumours are of large size, other pains from pressure may arise ; but by this time the diagnosis is sufficiently clear from the existence of the obvious tumour.   In some instances cramp-like pains are felt within the abdomen likened also to labour pains, and are evidently due to the exciting effect of the growth upon the uterine parietes, whereby these latter are induced to contract in an effort to expel or get rid of the tumour.

In *cancer* of the uterus, except when the disease commences in and tends to obstruct the cervical canal, pain is not a prominent symptom in the early stages of the disease ; and even in very advanced cases

* *Brit. Med. Journ.*, 1904, vol. ii. p. 1056.

pain is sometimes absent. As a rule, however, pain sooner or later appears. If the disease press upon or invade some of the neighbouring plexuses of nerves, various acute pains are produced. Thus, in the pelvis itself the patient may complain of a "boring, bearing-down, tearing or stabbing pain," while other pains may be referred to the hypogastrium, the loins and the posterior part of the sacrum; and they may even be reflected down the legs. According to Champneys,* pain is more frequently felt on the left side than on the right, and that irrespective of the situation of the disease.

The **Ovaries** receive their nerve-supply from the same sources as the uterus; that is to say, filaments are derived from the spermatic plexuses, or, as these are called in the female, the ovarian, and from the pelvic plexuses. The sensory branches come from the third and fourth sacral nerves; and the particular segment of the cord involved is, according to Head, the tenth dorsal (*see* Figs. 8 to 11). Although the nerve-supply is practically the same as that of the uterus, the functional activity of these organs, during the early years of adult life, renders them much more fruitful sources of pain in any diseased condition. Lesions of a much less pronounced type may give rise to symptoms out of all proportion to those originating in similar affections of the uterus. A chronic inflammation of the ovary may be a source of continual suffering, and unless properly recognised may be mistaken for other diseases of an abdominal nature. But the varied phases of diseases of the ovary would carry us too far away from the limited

* *Obstet. Trans.*, vol. xxii. 1880.

considerations with which we have to deal. It is
only so far as these diseases are productive of abdo-
minal or pelvic pain that we are concerned. Except
to some extent in character, the situation of the pain
does not vary materially. It is felt in the lower part
of the back, in either loin, in either inguinal region,
and in the hypogastric region. In some cases the
pain is located a little below the umbilicus, on one
or other side. The so-called " ovarian pain " is felt
at a point two inches to the inner side of the superior
iliac spine. Pain can be elicited and increased by
direct pressure made into either one or other iliac
fossa, as the case may be, or better still sometimes,
by digital pressure upwards in one or other fornix.
The pain in character may be of the nature of a dull,
heavy ache, or dragging, wearing sensation, with
exacerbations due to any intra-pelvic pressure, or
temporary congestion of the part from natural
causes. A *prolapsed ovary* may be a source of pain,
as also one which is secondarily involved, rather than
the primary source of disease itself. While it is
hardly possible to differentiate, merely by the abdo-
minal pain produced, the diseases of the ovary, it
may be said that inflammatory affections are more
productive of painful symptoms than cysts or growths,
at least in their early or initial stages. Occasionally,
although rarely, small ovarian tumours are tender
and the seat and source of pain (Doran).* Large
cystomata, or solid tumours, although productive
of abdominal pains, are sufficiently obvious of them-
selves in other respects not to need further attention.
In considering ovarian pain, whatever its character

* *Journ. of Obst. and Gynæcol. of the British Empire*, May 1904.

and from whatever diseased condition arising, it must always be remembered that all the symptoms may be referred to the side opposite to that of the affected organ.

Fallopian Tubes —With a nerve-supply practically identical with that of the ovaries, the pains which arise in connection with diseases of these structures are likewise similar, and what has been said in regard to the former, both as to the character, situation, and mode of production of the pain, might with equal truth be repeated here. It may, however, be added that Head considered pain and tenderness in ovarian disease to exist one segmental area higher than in affections of the tubes; in other words, that the latter were more particularly associated with the eleventh and twelfth dorsal segments ; and this he regarded as a valuable point in diagnosis —a fact which subsequent experience has tended to corroborate. A special class of pains is frequently associated with *tubal pregnancy*, and if rupture at any time occur, a sudden acute epigastric or umbilical pain is produced, similar to that following upon so many other acute intra-abdominal crises. As in the case of ovarian pain, so in connection with diseases of the tubes, the pain may be referred to the side opposite to that in which the disease is seated.

While an effort has been made to differentiate to some extent between diseases respectively of the uterus, ovaries and Fallopian tubes, so far as abdominal pain is concerned, it must be equally remembered that more frequently than not this one solitary symptom signifies nothing more than an intra-pelvic disorder applying with as much force to a general

pelvic peritonitis or cellulitis involving all the organs, as to an affection of one individual viscus. Hence, the question of ultimate diagnosis rests more upon the presence of other symptoms and other methods of examination. The interest of the subject, so far as the present discussion is concerned, turns upon the fact that pain complained of, say in the right iliac fossa, may have reference to some affection of the pelvic viscera, as much as it may be connected with disease of the appendix, cæcum or other part of the large or small intestine ; and that it behoves the clinician to weigh carefully all the other manifestations, that a correct interpretation of the symptoms may be arrived at. This aspect of the subject, however, will be more fully discussed when dealing with the relative significance of pain occurring in certain special regions of the abdomen.

CHAPTER XI

PAIN IN AFFECTIONS OF THE SPLEEN, AORTA, SPINAL CORD, SPINAL COLUMN, LUNGS AND PLEURA, PERITONEUM.

THE **Spleen** appears a peculiarly insensitive organ. Supplied by the splenic plexus, a derivative of the cœliac plexus, and receiving a branch from the right vagus, it produces little more than a local manifestation of pain in certain diseased conditions. Even this pain seems to be due more to the implication of the peritoneum which surrounds the viscus than to any special involvement of the organ itself. There are apparently no referred or reflected pains ; and such discomfort as is experienced in enlargements either from inflammation, malarial affections or tumour, is felt in, and limited to, the region of the left hypochrondrium, where there may be a sense of dragging when the patient moves about.

The **Aorta,** under certain conditions, causes abdominal pains by reason of its close association with the sympathetic plexuses which in part surround it, and the spinal nerves which also lie in close proximity. Any enlargement, therefore, such as happens in aneurysm, may cause pressure on these various nerves or stretch those visceral nerves which penetrate its wall proper. *Aneurysm of the aorta* need not necessarily be

abdominal in order to produce abdominal pain. Thus, when situated in the lower dorsal region, the pain may be referred to the regions supplied by the ninth, tenth, eleventh and twelfth dorsal nerves ; in other words, there may be a considerable extent of the whole abdominal wall involved in pain and tenderness. If the aneurysm be situated within the abdominal cavity, that is, against the bodies of the upper lumbar vertebræ, the following are the characteristics of the pain produced as described by Nixon* : " It is of two kinds, which are not, however, necessarily associated. The first is due to the irritation and stretching of the nerves above mentioned (*i.e.*, the great splanchnic nerves, the semilunar ganglia, and the solar plexus). It is essentially neuralgic ; it is intermittent, lancinating and paroxysmal, encircling the body like a girdle, or radiating through the abdomen, back, pelvis, and base of thorax, and not infrequently into either groin or testicle. The accession is sudden and usually attributable to some definite cause of vascular excitement. The duration extends over a period varying from one to three hours, rarely longer ; and the cessation is equally abrupt, leaving the patient in a state of exhaustion, but quite free from actual suffering. The second kind of pain referred to is continuous and boring ; fixed at a particular point of the vertebral column ; aggravated by pressure at this point, by active movement or stamping, and by gently turning the patient half round upon his axis in the standing posture, but relieved by assuming the prone position, or by

* Quain's " Dictionary of Medicine," p. 3.

leaning forward. Pain so characterised is patho-
gnomonic of erosion of the vertebræ."

When the aneurysm involves the lowest part of
the aorta, and implicates possibly more or less of
one or both common iliac arteries, the pains take
the distribution of the lower branches of the lumbar
plexus, and the pains are more marked in the limbs
than in the abdomen. But, apart altogether from
the production of pain, the other symptoms con-
nected with the situation and peculiar pulsating
properties of the swelling are those to which most
significance will be attached for the purposes of diag-
nosis.

The **Spinal Cord,** as may well be conceived, is
capable, in various of its affections, of producing pains
referred to the abdomen. As has been so frequently
alluded to, every referred or reflected pain owes its
existence to a certain segment of the spinal cord.
It is when one or more of those segments which lie
below the sixth dorsal enter into the chain of
diseases which affect the intra-abdominal viscera,
that they become respectively the links by which
certain distinctive sensations are transmitted to
more distant parts. We have, therefore, only to
conceive these segments involved in disease them-
selves to understand how they become no longer
the simple transmitters of painful sensations, but
the actual originators. The cord may be affected
either by acute or chronic inflammation, and its men-
inges may be similarly involved. It may be the seat
of tumour, or be pressed upon from without. In
many, but by no means all, instances pain will be a
symptom, but it will be a secondary consideration

in the matter of diagnosis, as compared with other symptoms which will co-exist or subsequently appear. The one striking feature about pain connected with diseases of the cord is its tendency to be of the " girdle " character ; the pains extend round both sides and meet in the middle line. This suggests irritation of the nerve-roots, and the conduction of the pain by means of the intercostal nerves, so that we may expect the development of the same pains when the trunks are involved—as they may be, in purely meningeal affections—as when the spinal roots themselves are implicated in diseases of the cord proper. The peculiar characteristics of these pains are that they are frequently very acute, spasmodic or neuralgic, occurring at irregular inter- vals, and often evoked by no known cause. The skin also is frequently hyperæsthetic over those parts where the sharp pains are felt, and this refers more particularly to the acute inflammatory conditions, such as acute spinal meningitis. In acute myelitis a cord-like feeling round the body is sometimes complained of. In chronic myelitis the pains depend more upon the particular columns of the cord in- volved. In disease of the posterior columns or tabes dorsalis, we have a special form of abdominal pain produced, which is liable to be mistaken for some gastric disorder, if due regard be not had to the other manifestations. Thus a so-called " girdle- sensation " may exist ; a feeling as if a constriction was present round the waist ; or there may be " lightning-like " pains, which are known by their momentary, stabbing character, and when present in the epigastrium, and coupled with severe sickness

and nausea, are known as " gastric " crises.   It is these acute attacks which are sometimes liable, in the earlier stages of the disease, to be mistaken for mischief connected simply with the stomach.   A careful scrutiny of each case, however, should soon lead to the detection of other symptoms sufficiently distinctive of a disease such as tabes.

Tumours involving the cord, either as growths within it or producing pressure upon it, seem to be rarer in the lower half than the upper.   Hence abdominal pains are probably extremely infrequent from causes such as these.   In most recorded cases *   some amount of pain has been noted during the early- stages, but pressure symptoms soon become mani- fest ; and the diagnosis rests upon certain definite paralytic symptoms more than anything else.

The **Spinal Column**.—In *caries* attacking any part of the spinal column below the sixth dorsal vertebra very distinct abdominal or pelvic pains may arise. These pains seem to be due more to secondary in- volvement of the spinal nerves by inflammatory invasion or pressure than to the actual disease of the bone itself.   It is when the primary trunks are implicated that we obtain those typical girdle pains so characteristic of the disease.   This type of pain is sometimes solely referred to the end of an intercostal nerve, so that the patient complains of pain in front of the belly.   An epigastric pain in children has frequently been mistaken by the friends for indigestion, while its true significance has been disease about the mid-dorsal region.   The pain may come on in seizures, evoked perchance

* *See* Cushing, " Annals of Surgery," 1904, part cxxxviii. p. 934.

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by any movement of the spine, or it may be a constant gnawing sensation. The true difficulty in these cases arises where there is posteriorly no marked angular curvature to physically denote the seat of disease. It will generally, however, be found possible to elicit pain at the spot by tapping or forcible pressing on the vertebræ where disease is suspected. Apart, however, from pain felt in the distribution of an intercostal nerve, there is often a deep-seated pain felt in the spine itself, even where no external evidences otherwise exist. A constant " back-ache " in the loin may indicate progressive tubercular disease of the body of a lumbar vertebra, which only later becomes corroborated by the appearance of an abscess.

The **Lungs** and **Pleuræ**.—That these viscera may be the source of acute abdominal pain when inflamed is sufficiently well known ; and yet many mistakes have arisen in connection with it. Remembering that the pleuræ line the upper surface of the diaphragm and the inner surfaces of the lower ribs, it will be at once understood how pain may be conducted by the lower intercostal nerves and felt in the front of the abdomen, that is to say, as if localised at the peripheral termination of those nerves. But the extent of the pain may be greater than that indicated, for in some cases of lobar pneumonia coupled with pleurisy, pain may be felt over the whole abdomen, even to the iliac fossa of the affected side. Thus an appearance of symptoms is produced strongly suggestive of acute peritonitis, and in not a few instances the prominence of these symptoms has been so great and overshadow-

ing that operation has been resorted to in the belief that some grave abdominal crisis existed. That, notwithstanding a tolerably extensive experience in acute abdominal affections, I was myself once mis-led in a case of this kind, tempts me to record the case in full; for I imagine the mistake might occur to any not sufficiently alive to the possible deceptive-ness of these symptoms. The case was as follows:

I was hurriedly summoned one afternoon to see, as the patient's doctor called it, " an acute abdominal case." Little time was lost before the doctor and I were at the bedside of our patient—a boy aged thirteen years. The history of his illness was that, up to the day before, he was in good health. But on the afternoon of that day, while, as his mother said, he was playing a whistle, he was suddenly seized *with severe pain in the right side of his back, about the lower border of the ribs.* This pain soon afterwards passed round to the epigastrium, and then seemed to extend over the abdomen. Ac-companying the severe pain was vomiting. Early the next morning the doctor was called to see him, and from the notes he kindly sent me subsequently, regarding his condition then and up to the time I saw him, I extract the following facts : " I found the boy looking acutely ill with a temperature of 103° F., pulse 100, and respiration 32. The pain in his belly had somewhat subsided. There was no cough, and he was able to breathe deeply without pain. I saw him again about eight hours later, when he looked alarmingly ill, his eyes sunken and face pale. The abdominal pain was still present, but less than in the early morning, but seemed to be

more diffuse over the belly. His bowels had moved freely, probably as the result of a large dose of castor-oil given before I saw him at all. His temperature had dropped to 101°, but his pulse had increased in rapidity and become ' thready.' His tongue was glazed and of a typhoid type."

A few hours later I saw the boy with his doctor. He presented what I regarded as a very toxic appearance. His features were pale and sunken ; he was drowsy and disinclined to answer questions. On palpating the abdomen, he whined when pressure was made in the epigastric region, and the parietes presented that rigid state so suggestive of commencing peritonitis.

Taking into consideration the history of the case such as I grasped it at the time, and the symptoms which for the moment presented themselves, I must own to having jumped at a very rapid and almost positive conclusion that the boy was suffering from some very grave intra-abdominal lesion, most likely of the nature of perforation. And I even went further ; for, learning there was a very strong tubercular strain in the family—the mother having suffered from hip disease, and a brother from spinal caries—I ventured the opinion that we were possibly dealing with a perforation of a tubercular intestinal ulcer. That the doctor—an exceptionally capable practitioner—supported me in my interpretation of the symptoms went not a little way towards my suggesting operation. Without any delay the boy was removed to the Victoria Infirmary, and as everything was in preparation, no time was lost in opening the abdomen. To my utter surprise there

was not a vestige of peritonitis. I examined the gastro-intestinal canal from stomach to rectum; there was not the remotest indication of a lesion; in short, the exploratory investigation proved absolutely negative. The boy was removed to the ward and remained in pretty much the same sort of typhoid condition until he died the following evening.

Permission for a post-mortem was fortunately obtained, and the report of the pathologist, Dr. John Anderson, was as follows: " A condition of acute lobar pneumonia, chiefly of the red stage, was found involving the upper part of the lower lobe and the entire middle lobe of the right side. Nothing was found within the abdomen except a little undue congestion of the mucous membrane of the lower part of the ileum." So far as the teaching of this case goes, probably the error in diagnosis arose from not sufficiently regarding the initial symptoms; these, as I have italicised in the report, had very special reference to mischief commencing in the right lung and pleura—the initial seizure was severe pain in the right side of his back. Doubtless, had the question of pneumonia entered our minds, and the lung been auscultated, we should have regarded the other symptoms in their right light and correctly interpreted the case.

It is not without added interest that such a good abdominal surgeon as Mr. Rutherford Morison, of Newcastle, was led into a somewhat similar error. His case, which was fully reported in the *Lancet*,* was as follows: " Some three years ago," he writes,

* January 1, 1903.

" I opened the abdomen of a young woman sent into the Infirmary as a case of ruptured gastric ulcer, a few hours after the onset of sudden agonising pain in the upper abdomen, attended by collapse, preceded by a history of stomach trouble, and followed by rigidity and tenderness of the abdominal wall. Nothing was found to account for the attack, but next day the signs of pneumonia at the left base were present, and the disease ran its usual course, the patient recovering. Since then I have more than once escaped a similar mistake by remembering that the pain attending chest inflammations may be referred to the abdomen and produce symptoms closely simulating those of acute peritonitis."

Mr. H. L. Barnard,* also in an interesting paper on the subject, refers to several other cases. It will thus be seen that to the abdominal surgeon the subject of abdominal pain in chest diseases is a most important matter to remember, and I shall not have dealt with it at undue length if, by what I have said, younger and less experienced operators may be led to avoid the pitfalls into which others have unfortunately fallen. I shall conclude by quoting from Mr. Barnard's paper the particular points to be attended to in differentiating between true abdominal disease and its mimicry as manifested by chest affections.

" The chief points to be observed are the rapidity of the respiration, often forty a minute or more, which is out of all proportion to the pulse-rate, which is seldom so frequent as one hundred a minute, and is

* *Lancet*, August 2, 1902.

not weak or wiry.   The respiration will often exhibit the curious catch at the top of inspiration which is characteristic of pleurisy.   The abdominal tenderness is, moreover, found to be chiefly superficial, and firm deep pressure with the flat hand may be permitted.   It will then be found that the abdominal wall becomes soft for a moment at each inspiration, which is not the case in acute peritonitis.   The absence of rings round the eyes and a temperature of about 103° F. should also make one hesitate to diagnose a serious and general peritoneal infection."

The **Peritoneum** varies considerably in its degree of sensibility.   Thus it is probable that the most sensitive part is that which lines the abdominal parietes, and therefore the part which, when affected, is most productive of pain.   The reason seems to be that the nerve-supply of the parietal peritoneum is directly from the spinal nerves, while that of the visceral is from the sympathetic, and as the sensory fibres are more abundant in the former than in the latter, the cause of more acute suffering in the one is probably sufficiently explained.   However, it must not be ignored that under certain stimuli any part of the serous lining may prove a source of acute pain. It is only in this way that it is possible to explain the excessively sharp pain felt on the rupture or perforation of any viscus or adventitious sac.   That certain materials are more productive of painful irritation of the peritoneum than others is amply proved by clinical experience.   The contents of the stomach or bowel, especially when themselves diseased, and the escape of inflammatory material of any kind,

are fruitful sources of the most acute kind of pain.
Further, it would appear that while any part of the
peritoneum will stand a process of gradual stretch-
ing—as in the growth of cysts, tumours, &c.—it
resents the sudden physical effects of a tear, twist
or tension. The pain produced in these latter
conditions is usually of the sharp, stabbing and
prostrating kind; the patient presenting those
typical mental and facial conditions so suggestive
of a grave internal lesion.

The pain in *acute peritonitis* is not strictly a
referred pain; it is solely limited to the parts
of the parietes embraced by the inflamed peritoneal
surface. In connection with this I will quote
Head's interesting remarks. He states:* " I was
long ago struck by the fact that in affections of the
peritoneum the pain and tenderness differed funda-
mentally from that of referred pain, in that although
the pain is well localised it does not follow the line
of the nerve areas. Thus, for instance, the patient
will refer the pain to an area both above and below
the umbilicus without at the same time complaining
of any pain in the back or loin. Moreover, there is
no true cutaneous tenderness in peritonitis, and the
tenderness that is present differs fundamentally
in character from that which accompanies referred
pain. If the skin only is picked up between the finger
and thumb in a case of acute peritonitis, the
patient complains of no pain, but directly the deeper
structures of the abdominal wall are included in
the gentle pressure, he complains of intense pain.
Thus firm steady pressure as a rule relieves referred

* *Brain*, vol. xvi. p. 94.

abdominal tenderness, whilst light pressure between
the finger and thumb, or even the pressure of the
clothes, at once elicits it.   On the other hand, in
peritonitis light cutaneous stimulation causes no
pain, but the slightest attempt at deep pressure,
or even the lightest percussion, at once causes
marked pain.   Again, the distribution of the two
forms of tenderness differs fundamentally.   The
tenderness of peritonitis may be present all over the
abdomen from the ensiform cartilage to the pubes,
and from one costal margin to the other, but it
never appears at the angle of the scapula or over
the sacrum and iliac crest.   On the other hand,
if referred tenderness extended over the area just
mentioned, spots of tenderness would appear to
a certainty over the ribs in the line of the angle
of the scapula, over the costal margin in the eighth
and ninth spaces, over the twelfth dorsal spine,
over the twelfth rib, and over the last lumbar and
first sacral spines.   Thus the tenderness of peritonitis
only makes its appearance over those points where
pressure, &c., can actually affect the peritoneum,
whilst referred abdominal tenderness is always
present over bony points where pressure cannot
possibly produce any effect on the abdominal cavity
or its contents."

While the foregoing remarks have special reference
to inflammation of the peritoneum lining the abdo-
minal walls proper, it must be remembered that
involvement of the pelvic peritoneum, more espe-
cially that part of it which lines the floor of the pelvis,
gives rise also to very acute pain, under conditions
almost precisely similar to those experienced in the

upper abdomen. Protected as the part is by the bony walls of the pelvis, it is not so exposed to sensitive influences ; nevertheless, the slightest pressure exercised on the acutely inflamed membrane causes acute suffering. The detection of an inflamed condition of the pelvic peritoneum is often a considerable aid to the diagnosis of acute disease within the pelvic cavity or of neighbouring parts. Thus, in cases of acute appendicitis, where the appendix is anatomically directed downwards into the pelvic cavity, pressure from a distended bladder or rectum may cause pain ; and again, in the female, distension of the same viscera will cause suffering in cases of some acute inflammatory conditions of the reproductive organs. Digital palpation either per rectum or per vaginam may elicit acute sensitiveness. A good method of detecting the existence of acute pelvic peritonitis in the female, is to tilt the cervix up suddenly with the apex of the forefinger: a sharp pain is at once produced.

In cases of chronic peritonitis such as arise from tubercular disease, there is not usually much pain, and such vague and colicky pains as may occur, generally owe their origin to implication of other parts —as the bowels—whose functions become impaired. This reasoning applies to most of the secondary effects of a peritonitis which has been cured by nature. Adhesions of all kinds and characters may result, and these, having the most varied attachments, may cause the most diversified symptoms. More often than not, and especially in the case of pelvic adhesions, the symptoms become referrable to the pelvic organs. In the abdomen adhesions are the

source frequently of some of the gravest classes of acute intestinal obstruction; and it always behoves the surgeon, in seeking for an explanation of these suspected cases, to ascertain the previous possible existence of any such cause.

In considering the peritoneum one naturally includes its major reflections, such as the mesentery, meso-colons, and the omenta. Between the two reflected layers forming these structures we have blood-vessels and nerves, lymphatics and lymphatic glands, and the usual connective tissues.

With regard, in the first place, to the **blood-vessels,** *thrombosis or embolism of a mesenteric artery or vein* may give rise to a most acute abdominal seizure; indeed, so like are the onset and progress of the symptoms to a case of acute intestinal obstruction, that the condition is much more frequently taken for one of that nature than for what it really is. And it has often happened, that not until the abdomen was opened, and deeply congested or even gangrenous bowel discovered, with a plugged condition of the vessels in the mesentery or meso-colon, has the true cause become apparent. Besides the acute epigastric pain which may mark the seizure, and the violent abdominal pains of a colicky character which may succeed, the symptoms most suggestive of the true nature of the crisis are, a marked and sudden fall of temperature, distension of the abdomen with gas, intra-abdominal effusion, and copious excessively fœtid stools. Adenot,* who discusses the subject at some length, indicates that it is possible, by the character and continuous flow of blood passed

* " Revue de Médecine," 1890, vol. x. p. 267.

per rectum, to determine which of the two mesenteric vessels is involved. If the blood is decomposed, the embolus is situated in the superior mesenteric; if, on the other hand, it is fresh, the inferior mesenteric is involved. These cases are usually fatal, whether operated upon or not, for the disease is not a mere accident as regards the blocking of the blood-vessels, but usually dependent upon some grave pathological change in connection either with the heart or the vessels.

The **Nerves** which are found in the mesentery, meso-colons, or omenta are those which are passing to the supply of the different gastro-intestinal viscera; hence, no doubt, the reason for any material damage to these passing trunks being referred to the parts of their terminal distribution. In this way may be explained the sudden abdominal pain produced in cases of internal or external strangulation of portions of these membranes. It is true that the symptoms of a strangulated portion of the omentum are not nearly so acute as in cases of intestinal involvement. This may be due to the fact that the omentum, more particularly, does not contain such an abundant supply of nerves. But for the nerves which these membranes are transmitting, it is probable that they are particularly insensitive, having very few sensory fibres supplied to their actual peritoneal surfaces.

The **Mesenteric Glands** are liable to enlargement from various causes. In all acute inflammatory conditions of the intestine they become increased in size, and this is sometimes remarkably illustrated in acute appendicitis, where the glands lying in the

meso-cæcum and ascending meso-colon, and extend-
ing up towards the middle line, are as large as
walnuts. It does not appear, however, that any
pain is experienced as a result.

In chronic enlargements, such as occur in tubercular
disease — *tabes mesenterica* — the glands may form
enormous masses within the abdomen, and yet
of themselves give rise to little or no discomfort.
When, however, either in the acute or chronic en-
largements, pus escapes into the abdominal cavity,
acute pain follows, and we have a train of symptoms
set up, similar to those already alluded to in other
instances of an escape of foreign irritating material
into the general peritoneal cavity.

The **connective tissue** lying between the two peri-
toneal layers may be the source of different kinds
of *growths, cystic* or *solid*. In nearly all instances,
however, the progress of these tumours is so uniform
and slow, that all the other structures accommodate
themselves to the gradual stretching to which they
are subjected, and it is rarely that any abdominal
pain peculiar to the growth itself, and apart from
pressure effects, is experienced.

What has been said in this connection equally
applies to nearly all tumours and inflammatory
swellings arising in the parietal subperitoneal tissue,
or in the parietes themselves. Existing in these
situations, their physical manifestations become so
obvious to sight and touch that, whatever pain
may ensue, it forms, from a diagnostic aspect, but
secondary aid to the correct appreciation of the
nature of the complaint.

CHAPTER XII

REGIONAL PAIN. ACUTE EPIGASTRIC OR UMBILICAL PAIN.

HAVING described the situation and character of the various abdominal pains produced by the functional or organic derangements of definite organs or structures, I propose now to reverse the consideration of the subject and deal with it in the way in which it clinically presents itself to the medical practitioner. In thus considering it, the natural difficulties connected with the manifestation of pain become strikingly evident. We may know perfectly well the kind of pain, and its most likely situation, in the disease of a certain organ ; but it is quite another thing to be able to say that a particular pain indicates definitely a particular disease. Yet this is the truly clinical aspect of the matter, the one which alone presents itself to us in our everyday work. The real difficulty, of course, is due to the fact that the same pain may indicate so many different affections, and the good diagnostician is not only he who knows every affection which may produce a like pain, but he who can carefully weigh all the various collateral or co-existent manifestations, and so arrive at a correct diagnosis. The most important of these two desirable acquirements is probably the first, for it is often not so much the

correct differentiation of the disease from which the patient is acutely suffering that is urgently required, as a correct appreciation of the gravity or significance of the early symptoms. Whether a patient is suffering from a perforated gastric ulcer or a perforated appendix is of no moment as compared with the early and prompt recognition that the patient is attacked with a lesion so grave that immediate action is necessary. Or again, it matters little whether a patient has intussusception or some kind of internal strangulation; what really is needed is the proper appreciation of the symptoms of acute obstruction, so that the least possible delay is entailed in affording the necessary relief.

It is, therefore, with the hope, that by indicating as fully as I can the possible significance of a special kind of pain in a particular region, errors may be avoided, as well as delay prevented, in the early recognition and treatment of many serious and urgent abdominal diseases.

I shall first discuss the acute pain which suddenly seizes a patient in the epigastric or umbilical region, a pain so sharp and agonising that it produces more or less rapid prostration, and causes the face to assume all the appearance of one seriously ill. There is in most typical instances no mistaking this symptom. It lasts for a longer or shorter period, and leaves the patient in an almost collapsed condition. The pulse is weakened and quickened; the temperature may fall; the skin become pale, cold and clammy; beads of perspiration may stand out on the forehead; the eyes become listless and sunken; and the patient compelled to rest in a recum-

bent position, with the body bent in efforts to relieve the excruciating pain. Now no patient so seized should ever be regarded except with the gravest fears. Palliatives may be given in the way of morphia injections and heated local applications, but these are only understood as means towards relieving the patient's immediate suffering, and nothing should blind the eyes of the attendant to the fact that he is possibly dealing with a fatal crisis, which, unless the most marked signs of improvement rapidly appear, must be promptly dealt with by the most advanced measures for relief. And here, let me say, that by advanced measures I do not necessarily mean operative intervention, but that the practitioner in attendance should not accept the sole responsibility of the situation, but at once seek the assistance of another, who may bear with him whatever the results may be, and aid by his opinion in furthering such prompt action as may be deemed advisable. Again, I repeat that in these grave cases no time should be wasted in seeking, *through delay*, to ascertain the possible cause of the seizure ; the proper recognition of the gravity of the symptoms is the most important factor. I am led to emphasise these remarks because, as the result of an extended experience in operating upon this class of cases, I, like many others, have so often been impressed with the fact that, but for the delay of bringing these acute cases under treatment, many a life might have been saved.

I shall not repeat here the reasons for this acute abdominal pain, any more than briefly to indicate that it is referred or reflected, and is brought

about by nerves connected with the great central solar plexus. With this plexus almost every intra-abdominal organ is brought into some sort of relation. Hence, therefore, the reason for so many diseases producing one single similar symptom.

How many diseases may give rise to acute epi-gastric pain becomes surprising when an endeavour is made to classify them. I have, however, at-tempted to do this, and while I do not profess that even this long list anything like exhausts all the possible causes, I believe it may be fairly considered to include the most important. Of course it must be clearly understood that all the symptoms of a typical acute attack, such as has been depicted above, are not to be expected as necessary manifes-tations in every one of the diseases here narrated. It is only because occasionally, and sometimes quite exceptionally, such a grave exhibition of acute symptoms does take place, that I have thought it right to include them. Arranged as nearly as possible according to the organs affected, the following is the list :

DISEASES PRODUCTIVE OF ACUTE EPIGASTRIC OR UMBILICAL PAIN.

STOMACH.

1. Acute gastritis.
2. Acute gastralgia (in py-loric stenosis).
3. Acute dilatation.
4. Acute gastric hæmor-rhage.
5. Perforation of gastric ulcer.
6. Traumatic rupture.

DUODENUM.

1. Acute hæmorrhage from ulcer.
2. Perforation of chronic ulcer.
3. Traumatic rupture (rare).

SMALL INTESTINE.

1. Acute obstruction.
   a. Internal hernia.

K

SMALL INTESTINE—(cont.)

  1. Acute obstruction—(cont.)
    b. Stricture.
    c. Bands.
    d. Kinking (from ad-
       hesion).
    e. Gall-stone.
    f. Volvulus.
    g. Intussusception.
    h. External pressure.
  2. Perforation of ulcer.
  3. Acute hæmorrhage.
  4 Acute enteritis.
  5. Traumatic rupture.

LARGE INTESTINE.

  1. Acute obstruction.
    a. Internal hernia.
    b. Stricture.
    c. Bands.
    d. Kinking.
    e. Volvulus.
    f. External pressure.
  2. Acute colitis.
  3. Acute mucous colitis.
  4. Acute ulcerative colitis.
  5. Perforation of ulcer.
  6. Acute hæmorrhage.
  7. Ruptured abscess.
  8. Simple colic.
  9. Traumatic rupture.

APPENDIX.

  1. Acute appendicitis.
  2. Gangrenous appendicitis.
  3. Perforation.
  4. Rupture of abscess.
  5. Colic.

RECTUM.

  1. Acute obstruction.
    a. Stricture.
    b. Growth.
    c. External pressure.
  2. Acute proctitis.
  3. Perforation.
  4. Rupture of abscess.

LIVER AND GALL PASSAGES.

  1. Acute perihepatitis.
  2. Biliary colic.
    a. Cholangitis.
    b. Cholecystitis.
    c. Gall-stones.
  3. Perforation or rupture.
    a. Gall-bladder.
    b. Ducts.

PANCREAS.

  1. Acute pancreatitis.
  2. Acute hæmorrhagic pan-
    creatitis.
  3. Pancreatic colic (im-
    pacted stone).
  4 Large tumours of pan-
    creas (which involve
    solar-plexus).
  5. Pancreatic apoplexy.
  6. Ruptured abscess.

MESENTERY.

  1. Embolism of superior or
    inferior mesenteric
    artery.
  2. Thrombosis of ditto.
  3. Rupture of cyst.
  4. Volvulus of entire mesen-
    tery.
  5. Tear.

KIDNEY.

  1. Renal colic.
    a. Calculus.
    b. Tubercular neph-
      ritis.
  2. Rupture of abscess (pyo-
    nephrosis).
  3. Rupture of hydronephro-
    tic sac.

BLADDER.

  Perforation.

SPLEEN.

  Traumatic rupture.

UTERUS.

  Rupture.

OVARY.
1. Rupture of cystoma.
2. Rupture of ovarian abscess.
3. Twist of ovarian pedicle.
4. Ectopic pregnancy (rupture).

FALLOPIAN TUBE.
1. Acute suppurative salpingitis.
2. Rupture.
3. Pregnancy (tubal rupture).

SPINE.
1. Caries.
2. Rupture of abscess.

LUNGS AND PLEURÆ.
Pneumonia and pleurisy.

HYSTERIA.

TABES DORSALIS.

LEAD COLIC.

CHOLERA.

MENINGITIS.
1. Cerebral.
2. Spinal.

EXTERNAL HERNIA.

As the object of this chapter is rather to enlighten as to the probable causes of acute pain, than to afford any more general description of the diseases giving rise to it, I shall not attempt any such detailed differentiation as would be entailed in searching out each cause. Indeed, such an effort would almost mean the writing of a volume respectively on Medicine and Surgery, so many and diverse are the diseases enumerated. But it will not be out of place to indicate along what lines investigation should be carried, in order to arrive, if possible, at some idea as to whether the disease may really be so serious as the initial symptom of acute pain would suggest ; whether, indeed, there is reason to fear that graver complications may be expected. Attention, therefore, should be directed to the following considerations :

(1) The *sex* and *age* of the patient will exclude many conditions, while they may render others probable. Thus, the pelvic organs of the female introduce a considerable class of cases. Women suffer more from gall-stones than men ; while the

latter, on the other hand, are more subject to renal calculus. In children a large number of gastro-intestinal diseases are excluded, but intussusception is one of the commonest causes of acute intestinal obstruction. Patients above fifty in both sexes, are liable to malignant disease of some part of the gastro-intestinal tract with other secondary com-plications, themselves the direct cause of acute symptoms. Neither age nor sex, it may be remem-bered, has any practical bearing on the occurrence of acute appendicitis ; neither do they seem to affect the particular type of the complaint which may manifest itself.

(2) The *previous history* of the patient will often afford assistance in those conditions where the acute crisis is simply the consummation of some earlier or pre-existent trouble. A history of previous attacks of biliary colic, pelvic inflammation, or general peritonitis, may suggest adhesions, bands, &c., as means by which acute obstruction could be produced. Any history of dyspepsia, with possibly hæmorrhage either from the stomach or the bowel, would suggest a perforated gastric or duodenal ulcer. Attacks of hæmorrhage from the bowel, however, may indicate some ulceration in the colon or small intestine below the duodenum. Previous attacks of pain in the right iliac fossa should always be remembered as indicative—particularly in the male subject—of a chronic appendicitis which has suddenly become acute. A tubercular family history with possibly a history of some tubercular lesion in the patient, may suggest tubercular ulcer, stric-ture or perforation of the bowel. The history of a

hernia is important. In newly-married women
the possibility of a ruptured ectopic pregnancy
should not be forgotten.

(3) The *occupation and habits* of the patient may
sometimes assist in forming a diagnosis. The effect
of irritant poisons: the previous knowledge of
having taken something known to disagree: lead
colic in the painter or plumber, or other lead-worker
or consumer of lead-impregnated water: disposi-
tion to neurotic manifestations or hysteria: sexual
indulgence as resulting in locomotor ataxy: the
known existence of cholera; all these are considera-
tions to be duly recognised and reckoned with.

(4) The *examination* of the patient. There are a
few important points to which attention should be
directed that may, without causing any delay, at
once suggest the gravity or otherwise of the seizure.
A digital examination of the rectum may reveal in
children a projecting intussusception; or, if the finger
can feel nothing, it may be tainted with blood-
stained mucus, which is almost equally as significant.
Again, a malignant mass or stricture may be felt
obstructing the rectum, the existence of which, until
giving rise to sudden acute obstructive symptoms,
the patient has never previously been cognisant of.
In nearly all cases of perforation or rupture into the
general peritoneal cavity there is extreme tenderness
on any attempted deep palpation ; and the tender-
ness is frequently greatest at the actual seat of per-
foration. Thus, in perforated gastric ulcer, the point
of most extreme sensitiveness to pressure is in some
part of the epigastrium immediately over or nearest
the actual seat of perforation. In the case of the

appendix, it is most frequently in the right iliac fossa. However, it must be remembered that this is no hard-and-fast rule, for frequently these tender spots are simply indications of some inexplicable reflected pains ; and operators know too well that, when sometimes they have fully expected a perforated gastric ulcer from the locality of the pain and tenderness, no such lesion has been discovered. If, on the other hand, pressure upon or palpation of, the abdomen seems to relieve rather than augment the pain, the likelihood is that perforation at least does not exist, but that, where obstruction is suspected, it is due to a strangulating influence whereby the bowel in some part is mechanically interfered with.

While the pulse is usually of little service except in indicating from its weakness and rapidity the gravity of the initial shock, the temperature is often helpful in distinguishing an inflammatory cause from one which is non-inflammatory. With, I believe, but few exceptions, a temperature running above 100° F. indicates that the lesion is of inflammatory origin, or in some way connected with inflammation. I have known instances where the rise of temperature has, for example, served to differentiate between an attack of obstruction due to appendicitis and one supposed to owe its origin to some other cause.

Among other points to be regarded at the preliminary investigation is an examination of the external abdominal rings, those seats where a hernia is liable to exist. Two cases have come under my own observation where a mistaken diagnosis has been made in this respect. In both, the patients were rightly described as suffering from acute intes-

tinal obstruction. In neither had the true cause been discovered. In the one case, a woman, there was a strangulated femoral hernia to which the patient never attracted the attention of her doctor ; and in the other, that of a man, there was a strangulated inguinal hernia. In the latter case the patient had misled his doctors by telling them that he had been struck on the testicle, and that the vomiting from which he suffered was due to that. How greatly misleading had been the guiding evidence of the patient may be judged from the fact that some three or four medical men had overlooked the real cause, with the result, that such delay took place, that the patient died notwithstanding the operation attempted for relief.

Lastly, an examination of the lungs and pleural cavities should be remembered in obscure cases ; and in women a vaginal examination should not be omitted, particularly in cases where earlier premonitory symptoms might suggest pelvic trouble, or where some irregularity in menstruation during the early months of married life might excite suspicion that a ruptured extra-uterine pregnancy had taken place.

CHAPTER XIII

SUB-ACUTE * ABDOMINAL PAIN—ANTERO-LATERAL.

THE kind of pain which I now wish particularly to
refer to is that which is most aptly described in the
patients' own way of usually indicating it, that is,
by saying they suffer from occasional or repeated
attacks of "stomach ache," or, in less euphemisti-
cal, though possibly more exact language, "belly
ache." The expressions, as we professionally
know them, have a tolerably wide significance ;
and it is in relation to these wider and more
extended phases of them that the following re-
marks have reference. Sometimes these pains are
sufficiently localised to indicate fairly distinctly
the possible source and nature of the affection,
as, for instance, when occurring in the right iliac
fossa or in either lumbar or hypochondriac region.
But pain in these situations I intend to deal with
separately, only it needs to be remembered that
affections which, as a rule, may give rise to pain
limited to special areas, may also cause manifesta-
tion in more distant parts. The reason of this
diffusion is to be found in what has already been
fully discussed—the production of certain " referred "
or " reflected " pains. It would seem as if the

* The term "sub-acute," as it will be used here and in future, does
not mean that the pain may not sometimes be severe, or indeed
acute, but that it does not partake of that prostrating character
typical of the kind described in the preceding chapter.

character, degree and relative intensity of the pain had much to do with its special manifestations ; or perhaps it would be more correct to use these qualifications in respect to the diseases producing the pain. For, as indicated above, in the consideration of acute epigastric or umbilical pain, any sort of grave lesion, occurring in parts connected by their nerve-supply with the great central solar plexus, produced practically one and the same result. It would seem, however, that when the efferent impulses to that plexus were not sufficiently stimulating, no such solitary and distinctive evidence was forthcoming, and that, instead, less defined and less intense pains resulted. It is then with these latter that we have at present to deal ; pains occurring, so far as situation is concerned, mostly in the antero-lateral parts of the abdomen—those parts which patients popularly regard as constituting the belly.

The outstanding feature of these pains is their chronicity. And by a chronic pain is to be understood not so much one that is constantly present, as one that is of an intermittent character, recurring at indefinite intervals, and sometimes traceable, though by no means always so, to a definite cause.

These sub-acute or chronic pains are as variable in their character as they are in their intensity. Sometimes merely a transitory gripe is complained of, which, after it has passed off, leaves the patient as well as ever. At other times the discomfort is more lasting, and seems to be connected with the passage of something, the propulsion onwards, or actual ejection of which, affords immediate relief.

Various terms are used in describing the nature

of these pains. With some they are colicky, neuralgic, or spasmodic ; with others they are boring, wearing, gnawing, burning, screwing, worrying, and suchlike expressions, all more or less indicative of a deep-seated sensation. As regards intensity, there may be the greatest possible variation, ranging between a mere discomfort to an almost intolerable endurance.

Now the majority of these chronic or sub-acute intermittent pains in the abdomen owe their origin to some impairment of, or impediment to, the normal muscular action of a viscus ; that is to say, from some cause either within or without the organ, the muscular tissue is excited into abnormal contraction. This increased effort may be brought about through an endeavour on the part of the involved segment to expel some irritating material or to overcome some obstruction. Thus, one of the most fruitful sources of these colicky pains is to be found in some such derangement of the intestinal canal. It may be that some irritating material has been taken by ingestion, which the bowel resents, and seeks by violent peristaltic action to expel. Or from some such irritating cause the mucous membrane has become inflamed and thereby itself creates a constant source of abnormal stimulation to the muscular tissue. Again, the irritating effects of an ulcer may produce a like result. And, rightly or wrongly, it is the commonest thing to hear patients state, that when suffering from transitory attacks of intestinal colic, they have been told they had " ulceration of the bowel," the real truth, however, often being, that this is merely a cloak for ignorance ; a diagnostic mask for what is not known.

Among other internal sources of interference with the proper action of the bowel are strictures either innocent or malignant.   In this class of cases the pains often assume a somewhat typical character.   The patient describes them as " screwing," meaning thereby that a vermicular action of the bowel is taking place and working gradually up to the seat of the obstruction ; here it is often felt to give way, and at the same time something passes which affords the necessary relief.   The description really corresponds to what is actually taking place.   The bowel proximal to the stricture is making abnormally violent and irregular efforts to drive its obstructed contents through the constricted channel, and at last succeeding, quiets down, until again forced from the same cause to repeat the struggle.

The results of external influences are pretty much the same as those just narrated.   Adventitious bands or adhesions may kink or compress the canal, and so similarly interfere with a segment propelling onwards its contents.   It would seem that not only pathological conditions are responsible for certain kinds of obstructive effects in the large intestine.   Whether from developmental or acquired causes, both the hepatic and splenic flexures of the colon may prove a source of obstruction to the onward progress of the fæces, and colicky pains may be experienced when the proximal segments of the bowel have to exercise abnormal efforts to drive their solid contents past these kinked corners. These pains, like most others connected with the large bowel, usually make their appearance when the patient seeks an evacuation.   The stomach, perhaps,

even more than the bowel, is a fruitful source of
sub-acute pain. The many distressing discomforts
of obvious attacks of gastric indigestion are suffi-
ciently well known to need only a passing notice—
at least those of them distinctly traceable to some
flagrant indiscretion in diet. There are other dys-
peptic pains which may have much more serious
significance ; and such as occur as a more or less
constant sequel to the ingestion of certain otherwise
quite digestible foods should not be lightly regarded.
The seat, however, of gastric pain is so invariably
limited to the epigastric region, that no difficulty will
in most cases arise as to the organ affected.   The
real nature of the disease will be more likely deter-
mined by the existence of other symptoms than by
that of any striking peculiarity in the character
of the pain.   In the attacks, however, of gastralgia,
which arise from obstruction at the pylorus, the
spasmodic seizures, of sometimes excruciating pain,
are of distinct diagnostic significance.   Yet another
frequent source of sub-acute pains, situated mostly
in the lower abdomen, or hypogastric region, is
disease or functional derangements of the pelvic
organs.   In the case of the female, it is more likely to
be associated with one or other of the reproductive
organs ; while in the male the bladder or prostate
may be at fault.   It would entail almost too much
repetition to make a separate list of all the diseases
that might produce chronic or sub-acute intermittent
pain within the abdomen ; for a very large number
of those which have been given as capable of produc-
ing acute epigastric or umbilical pain are as fre-
quently the source, at some antecedent period, of

giving rise to less marked attacks of suffering. While, therefore, I append a list of the more frequent and striking examples, the diagnostician should equally consult the above series, and so allow nothing to escape him which might prove to be the true or likely cause.

DISEASES PRODUCTIVE OF CHRONIC OR SUB-ACUTE PAIN LOCATED OVER THE ANTERO - LATERAL ABDOMINAL REGION.

ŒSOPHAGUS.

Obstruction at lower end.
    a. Simple stricture.
    b. Carcinoma.

STOMACH.
1. Dyspepsia from various functional derangements.
2. Acute catarrhal gastritis.
3. Chronic catarrhal gastritis.
4. Ulceration.
    a. Innocent.
    b. Malignant.
5. Hour-glass contraction.
6. Pyloric obstruction (gastralgia).
7. Gastroptosis.
8. Dilatation.
9. External adhesions.

DUODENUM.
1. Duodenitis.
2. Ulcer.
3. Stricture.

SMALL INTESTINE.
1. Internal irritation (due to irritating contents).
2. Enteritis.
    a. Simple acute.
    b. Chronic mucous.

SMALL INTESTINE—*(cont.)*
3. Ulceration.
    a. Simple.
    b. Tubercular.
    c. Typhoid.
    d. Malignant.
4. Temporary obstruction due to
    a. Bands or adhesions.
    b. Kinking.
    c. Internal hernia.
    d. Twist.
    e. Chronic intussusception.
    f. Stricture.
        1. Simple
        2. Malignant.
    g. Partial impaction of solid contents (gall-stones, foreign matter).
    h. External pressure.

LARGE INTESTINE.
1. Internal irritation (due to irritating contents).
2. Colitis.
    a. Acute.
    b. Chronic.
        1. Simple.
        2. Mucous.
        3. Ulcerative.

LARGE INTESTINE—(*cont.*)

3. Ulceration.
   a. Innocent.
   b. Malignant.
4. Temporary obstruction due to *a, b, c, d, e, f, g, h,* causes in small intestine.
   i. Idiopathic or congenital dilatation.
   j. Obstinate constipation.
5. Coloptosis—a cause of *j.*

APPENDIX VERMIFORMIS.

1. Inflammation.
   a. Simple catarrhal.
   b. Infective.
   c. Ulcerative.
      1. Simple.
      2. Tubercular.
      3. Typhoid.
   d. Suppurative (abscess).
2. Kinking or flexion.
3. Stricture.
4. Concretions.

RECTUM.

Usually only from temporary obstruction due to blocking of the canal by simple stricture or malignant growth.

PANCREAS.

1. Pancreatitis.
   a. Acute.
   b. Chronic.
   c. Suppurative.
   d. Hæmorrhagic.
2. Calculus.
3. Tumour.
   a. Innocent (cystic or solid).
   b. Malignant (ditto).

LIVER.

1. Congestion.
2. Catarrh of the bile-ducts.

LIVER—(*cont.*)

3. Interstitial hepatitis.
4. Abscess.
   a. Pyæmic.
   b. Tropical.
5. Tumours.
   a. Innocent.
   b. Malignant.
6. Hepatoptosis.
   a. Partial (floating lobes).
   b. Complete.

GALL-BLADDER AND GALL-DUCTS.

Affections of these may cause pains directed towards the upper median parts of the abdomen.

KIDNEYS AND URETERS.

The pains are occasionally reflected centrally. A displaced, movable or floating kidney is sometimes a source of central abdominal pain.

ANEURYSM OF AORTA OR MESENTERIC ARTERY.

SPINAL CARIES with or without abscess formation (Psoas. Lumbar. Iliac).

SPINAL CORD AND MEMBRANES.

1. Inflammation.
   a. Chronic (Tabes) of cord.
   b. Ditto of Membranes.
      1. Traumatic.
      2. Tubercular.
      3. Syphilitic.

UTERUS AND ADNEXA.
    While pains from affections
    of these viscera may be
    felt in the anterior part
    of the abdomen, they are
    mostly located in the
    iliac regions, where
    they will be fully dis-
    cussed.

BLADDER.
    1. Inflammation.
        a. Acute cystitis.
        b. Chronic cystitis.
    2. Ulceration.
        a. Tubercular.
        b. Malignant.
    3. Calculus.
    4. Tumour.
        a. Simple.
        b. Malignant.
    5. Hyperdistension.

PROSTATE.
    1. Inflammation.
        a. Acute prostatitis.
        b. Chronic prostatitis.

PROSTATE—(cont.)
    2. Impacted calculus.

PERITONEUM.
    1. Inflammation.
        a. Tubercular periton-
            itis.
        b. Malignant disease.
        c. Septic peritonitis
            (mostly pelvic).
    2. Adhesions.

PARIETAL CONNECTIVE TISSUES.
    1. Inflammation (abscess).
    2. Tumours.
        a. Innocent.
        b. Malignant (subperi-
            toneal sarcomata).

LEAD COLIC.

HYSTERIA.

LITHIASIS (gout).

ENTERALGIA.

HERPES.

FLATULENCE (a symptom).

As was stated in the case of acute abdominal pain, so I would repeat here, that the particular object held in view is not so much the correct differentiation of the diseases productive of chronic or sub-acute abdominal pain, as the mere knowledge of what actual complaints can cause suffering of the kind here understood. That such and such a disease is the real cause of the patient's illness must depend for verification on many more symptoms than the solitary manifestation of pain. In order, however, that some approximate diagnosis may be arrived at, I shall classify a few considerations that may be helpful.

(1) *Sex* and *age*. In women, inflammatory and other affections of the reproductive organs must

always be borne in mind. The greater frequency of gall-stones also renders them more liable to peri-pyloric adhesions with obstructive effects upon the stomach, duodenum and colon. Neurasthenia, predisposing as it is to the production of diffused and referred pains from often comparatively slight functional disorders, is common in women. Obstinate constipation is much more frequent in women than men, and is a source sometimes of abdominal pain. Hysteria in the female, and hypochondriasis in the male, attack adults alike. In children most sub-acute abdominal pains are indicative of gastro-intestinal trouble. The possibility of irritating contents should always first be considered, after which tubercular ulceration and incomplete obstruction from chronic intussusception. In connection with this last cause I will quote a case which came under my observation some time ago. It serves to illustrate also very well how easy it is, when not sufficiently regarding the significance of repeated attacks of abdominal pain, to mistake the true nature of the complaint. A boy, aged three years, was sent to me because of constantly recurring attacks of cramp-like pains in the lower abdomen. Up to about three months prior to my seeing the child he had been perfectly strong and well. But at this time he was seized with pain in his abdomen ; it was not sufficiently acute to be regarded as serious, and his doctor, who visited him at the time, saw neither blood nor slime in the motion, which passed freely. Poultices and hot stupes were applied to give relief, but, notwithstanding these, paroxysms of pain would come on about three times a day. He continued

much the same for a month, constantly having attacks of cramp-like pains. Then they eased off for a time, until recurrence took place, when the pain was more diffused over the whole abdomen. It was possible for him to keep his bowels fairly regular by medicine, and attention to diet. His doctor considered the case one of " chronic catarrh of the bowels." As, however, the boy was getting gradually thinner, and the pains still continued, he was sent to me. His symptoms as they presented themselves were obviously those of chronic or incomplete obstruction ; and I diagnosed chronic intussusception as a probable cause, in view of the fact that his seizure was comparatively sudden, and that up to the commencement of his illness he was a robust child, like the other members of the family, including the father and mother. I operated, and found an ileo-colic intussusception. As reduction was impossible, I excised the parts involved, embracing the lower end of the ileum, the cæcum, and part of the ascending colon, closed up the distal end of the colon, and planted the ileum laterally into the colon just above the line of occlusion. The boy made an uninterrupted recovery.

In patients passed middle age, chronic pains, when associated with other symptoms of obstruction, should excite suspicion as to the possible existence of malignant disease of the colon ; and the probabilities of this being the cause of the suffering increases proportionately with age. In young adult life, of either sex, cramp-like pains, intermittent in character and also associated with other obstructive symptoms, usually indicate ulcer or stricture of the small intes-

tine, the result in almost all cases of tubercular disease. The cases of this class are comparatively common, but I will quote one which came under my care for treatment, and illustrates a remarkably severe and advanced case of the kind.

The patient was a young man, aged twenty-one years, under the care of Dr. Turner, of Saltcoats, N.B., who sent him to me. About twelve years previously he had suffered from " inflammation of the bowels," coupled with tenderness and rigidity at the lower part of the abdomen. He was ill for nearly six months, and about the same period after his recovery he was again seized with a second somewhat similar attack, lasting also for the same time. He then remained well for some five or six years, when he began to be troubled with what he described as indigestion. This entailed considerable care in regard to his food and the regulation of his bowels. He remained in pretty much the same condition until a year ago, when he had his first seizure of tolerably acute pain about the region of the umbilicus. Subsequent to this seizure he had had several others, varying both in acuteness and the length of time they lasted. They were mostly felt below and to the left of the umbilicus, and came to be associated with abdominal distension and the visible existence of peristalsis. As the case was one evidently of chronic obstruction, I opened the abdomen. The small intestines were found completely matted together by loose fibrous adhesions in such a way that no free coils could be seen. With the assistance of my colleague, Mr. James Grant Andrew, and my resident assistant, Dr. Wilson, I commenced to separate some of these adhesions,

when we discovered three separate places where the bowel was so intimately bound down and bent upon itself, that there seemed little doubt that these involved regions were the causes of obstruction. We therefore set to work to try and liberate the engaged loops.   Before this was accomplished we had opened the bowel in half a dozen places.   The smaller openings were closed by a single purse-string suture, the larger by a double series of Lembert sutures.   Further details of this case I need not give. The operation took two hours, and the patient's convalescence about eight weeks.   He was freed from all further pain and obstructive symptoms, but still found it necessary to occasionally take aperients when the bowels did not move freely.

Appendicular colic, or pains connected with a sub-acute or chronic appendicitis, are all alike sometimes felt in the central abdomen, and occur at any age, and without any special selection as to sex.

Aortic aneurysm is commoner in men, and occurs from the age of forty years upwards.   Affections of the bladder producing hypogastric pains are also more frequent in the male sex.   Traumatism as a factor in the production of lesions, such as tears of the mesentery, contusions of the bowel, internal hernia, causing subsequent symptoms, are more likely in the adult male.

(2) The *previous history* of the patient may have important bearings on detecting the possible nature of the case.   Thus, a history of some antecedent attack of internal inflammation would suggest, in a case presenting obstructive symptoms, that these were possibly due to stricture or adhesions.   A

patient who has suffered from biliary colic, coupled with feverishness and tenderness over the region of the gall-bladder or gall-passages, might later become the subject of pyloric or duodenal obstruction, or even of some occlusion of the colon. In one case, the narrowing of the canal might be the result of a stricture following upon ulceration of a gall-stone through the gall-bladder or gall-ducts into the viscera below; in another, the inflammation set up around an impacted gall-stone, might lead, through the contraction of the subsequently formed adhesions, to some narrowing or kinking of either the pylorus, duodenum, or colon.

Then, again, the existence at some antecedent date—and it may be a matter of years—of what is sometimes called " inflammation of the bowels, "suggests the possibility of old tubercular ulceration of the bowel, which may have resulted in the formation of a stricture within the canal, or of such an amount of matting without, that the progress of the intestinal contents is impeded. This aspect of the subject is very well illustrated in the case given above, where, it will be remembered, the patient suffered from very unmistakable indications of tubercular ulceration, with probably some amount of tubercular peritonitis, as long ago as eleven years, before serious obstructive symptoms commenced to show themselves. It is not, however, only in the form of strictures and matting connected with the bowel or peritoneum, that the results of tubercular lesions within the abdomen are seen. In enlargements of the mesenteric glands, due to tuberculosis, adhesions are sometimes contracted with neighbour-

ing parts, and these becoming subsequently stretched form bands, beneath which loops of intestine may become temporarily ensnared. It was an opinion strongly held by the late Dr. Joseph Coats, Professor of Pathology to the University of Glasgow, that the large majority of cases, in which bands or adhesions of any extent were found within the abdomen, owed their origin to some antecedent attack of tubercular peritonitis. In addition to this question of previous internal attacks of inflammation is another, which tends to lend support to the cause being tubercular, and that is either a tubercular family history, or other external tubercular manifestations on the patient.

Again, a previous history of pelvic inflammation in women has frequently important bearings on the possible production of obstruction. Pelvic cellulitis, whether arising after parturition, or from some " tube " affection such as tubercular, gonorrhœal, or other form of salpingitis, is apt to leave in its wake adhesions which, if attached to any part of the intestine, either large or small, may kink, constrict or impair them in such a way as to cause obstructive symptoms.

A history of gradually increasing difficulty in obtaining a movement of the bowels in patients who have never been previously so discomforted is usually suggestive of stricture ; and if the patients be considerably over middle age, malignant disease of the colon may reasonably be suspected.

A history of vomiting blood, if coupled at the time with other gastric symptoms, might suggest that a gastric ulcer previously existed, and that the

present symptoms of gastric pain are due to some impairment of the action of the stomach, through contractions either of the body or pyloric orifice, or from the formation of external hampering adhesions. Passage of blood by the bowel is sometimes important, as indicating previous ulceration somewhere throughout the canal. The higher the part from which the blood comes, usually the darker and more offensive it is. Thus, the bleeding from a duodenal ulcer produces usually what are called " tarry " stools ; but the colour depends mostly upon the time the blood has lodged in the bowel and the effect of the gastro-intestinal secretions upon it. So that the same " tarry " stools may be met with when blood comes from the canal much lower down, even in the colon. Further, it should be remembered that patients are apt, when leading questions are put to them, to give an answer in accordance with what they think may possibly have been, although what really was not; and as often to consider highly coloured or abnormal that which we should consider of no significance. Hence the question of the passage of blood either from the stomach or the bowel is usually not one of much diagnostic value, when it is only the patient who can testify to it. If, however, it has been seen by a medical attendant, and therefore sufficiently vouched for, the history becomes of value in possibly helping to a solution of the patient's present suffering.

The question of food is one which should always be inquired into, especially in the case of children, who are very liable to intestinal irritation from

undigested material.   Even adults are not exempt
in this respect.   In one of my own cases a woman
suffered from temporary obstruction due to consum-
ing a quantity of gooseberry skins ; and many a
case of temporary intestinal colic can be traced
to the ingestion of certain foods.   The history of an
injury to the abdomen such as might be produced
by a blow, a squeeze, or the passage of a wheel
over the part, is of some significance, and especially
when the accident entailed the patient's confine-
ment to bed for a time ; for such might be taken
to indicate that the injury was probably grave
and sufficient to necessitate careful treatment.   A
severe contusion of the bowel might subsequently
lead to stricture, and a tear of the mesentery leave
a hole through which a loop of bowel could slip.
Adhesions might also result, with all their possible
attendant ills.

When general abdominal pain is dependent upon
either biliary or renal calculi, it is usual to find, in
addition, more typical manifestations in the usual
seats for pains connected with these conditions,
although cases do occasionally occur where a central
abdominal pain is the sole seat of suffering.

(3) The *Examination* of the Patient.—Attention
should be first given to the *inspection, palpation* and
percussion of the abdomen, and more particularly
to those parts where pain is complained of.   In
many cases of chronic intestinal obstruction there
will be found to accompany the cramp-like or colicky
pains very clearly defined rolling waves of peristalsis.
If the obstruction be at the pylorus, large waves
will be seen to start from the left hypochondriac

region, and slowly pass across the abdomen to disappear on the right side. If, on the other hand, the obstruction be lower down either in the small or large intestine, these peristaltic waves may be seen coursing in any direction, arising at one place and gradually disappearing at another. Although the symptom is probably more commonly present in stoppage of the large bowel, it is quite as distinct in some old, or comparatively long-standing cases of obstruction in the small. So distended and hypertrophied may segments of the jejunum or ileum become, that but for the absence of the appendices epiploicæ and the longitudinal bands of muscle tissue, it would be impossible to distinguish them at an operation for parts of the colon. Inspection may further reveal some irregularity of the surface of the abdomen. Not only may it be generally distended, but there may be parts where bulging is more marked, a bulging, too, due to a locally distended segment of bowel. This is known to occur in cases of volvulus. A somewhat striking case of the kind came under my observation about a year ago, in a man aged fifty years, who was the subject of what we are at present considering—intermittent attacks of pain in chronic obstruction. At times the central part of his belly would project and become highly tympanitic. When in one of these attacks he was brought into the theatre for operation, and just as he got under the influence of the anæsthetic, the swelling disappeared. I opened the abdomen and found an omental band extending across the large bowel, not one sufficient apparently ever to dangerously strangulate the gut, but quite enough to occasionally

obstruct it and cause its distension. When, how-
ever, the tension reached a certain point, the gas
escaped and the part again collapsed—at least this
seemed to me the most likely explanation of what
occurred.

But inspection may detect a projection which
palpation will construe into a cyst or solid tumour;
and this a more careful examination will convert
into a truer estimate of the connections, relations, and
general characteristics of the swelling. Any differen-
tiation in this respect, however, I shall not pursue
further; sufficient for the present purpose is it, that
something definite has been discovered, and is the
probable source of the abdominal pain. But palpa-
tion may go further and elicit some definite painful
spot which, from the region in which it is felt, may
help in determining the possible cause. There is
one fallacy in this connection which it is well to
remember, that, when we are dealing with adhesions,
pressure at a particular part may cause pain, not
because the true mischief is located there, but
because the adhesions which are associated with
the seat of disease are indirectly pulled upon or
stretched, so that irritation of the part is produced
and pain results. Another fallacy may be indicated
here, the supposed detection of a tumour which is
nothing more than a fæcal mass. The error is some-
times difficult to avoid, especially when a scybalous
lump is small, hard and movable. If sufficiently
accessible to be pressed upon, the alteration in shape
of which it is capable should excite suspicion; and if
on a subsequent examination the same lump cannot
be felt, its true character becomes tolerably clear.

A deep inspiration may render a tumour palpable, by causing it to descend into a more accessible situation ; such a means applies to tumours of the pylorus, liver, and gall-bladder, and to dislocated or floating kidneys. Lastly, palpation is always greatly facilitated by the administration of an anæsthetic, the abolition of the reflexes and the complete relaxation of the parietal muscles permitting a much more complete examination.

In *percussion* we have a means of discriminating between a swelling which contains air and one which is solid or contains liquid. A dilated stomach may be distinguished from a distended colon by the difference in tone of the two notes. It is rarely that this difference cannot be detected if the true stomach note is first ascertained by percussing over the lower left costal area. A dilated stomach occurring in otherwise healthy patients strongly suggests obstruction, from some cause, of the pyloric orifice. Percussion may also be the means of detecting certain dull areas, which, taken with other suggestive signs, may lead to the diagnosis of the condition.

Further points to be considered in the examination of this class of cases are the *digital explorations* of the *rectum* and *vagina*. A finger in the rectum may detect a stricture of the part, either cicatricial or malignant ; or from the cavity-like (" ballooning ") condition of the canal, a stricture higher up or actually in the sigmoid may be suggested. In males the various affections of the bladder and prostate may be detected. In young children it is possible to examine almost the whole of the abdomen by forcing the index-finger well up the

bowel, and using the other hand for counter-pressure upon the abdominal wall. An intussusception can be easily detected, and with equal facility a vesical calculus. The introduction of the whole hand may be sometimes deemed expedient for diagnostic purposes, but the procedure should not be lightly undertaken, from the possible direct injuries that may be inflicted on the bowel through over-distension.

Vaginal examinations reveal any abnormal conditions of the uterus, tubes and ovaries; any pelvic adhesions; any collection of fluid within Douglas's pouch; the existence of cysts either of the ovary or broad ligament; and the presence of myomata or cysts of the uterus.

The motions should be examined for their character as to consistency, shape and constituents; also the effects of a copious enema in cases where chronic obstruction is suspected. The temperature is of some moment as indicating that, where there is a rise, there is in all probability some active inflammation connected with the condition. The pulse counts for little in most cases of this class; it offers, therefore, a striking contrast to the last series of acute cases. If it is quickened, it is usually because the temperature is heightened.

In conclusion, I would refer the reader to chap. vi., p. 51, where the proper method of examining the abdomen is fully discussed, so that what has been only briefly indicated here, may be more accurately executed to the eliciting of such facts as may be necessary for correct diagnosis.

In the list of affections given above, capable of causing sub-acute or chronic pain mostly in the

anterior abdomen, I have included affections of the appendix. We are so apt to regard chronic pains connected with diseases of this appendage as located in the right iliac fossa, that I should like to instance two cases that have come under my observation where the pain was entirely located in front, and where I think it was fairly impossible to make a correct diagnosis before operation. Indeed, the situation and character of the pain led to suspicions quite other than those likely to have been regarded as appendicular in origin.

A girl, aged four and a half years, was admitted into my female ward at the Victoria Infirmary for supposed obstruction of the bowels. The story given us was that for several days she had complained of vague pains in her abdomen, mostly just below the umbilicus. They were not severe enough at first to prevent her running about, but more recently her symptoms had considerably increased, and when admitted to the Infirmary the child looked decidedly ill. It was stated that her bowels had not moved for five days, but that flatus had passed just before coming to the Infirmary. She looked pale and thin, with a tongue thickly coated with white fur; temperature 100°; pulse 130, and respiration 32. Her complaint was mostly of pain, not severe, just below the umbilicus. The abdomen was distended, but no rigidity or tenderness could be detected by palpation. Her feverishness suggested an inflammatory condition somewhere, but there was no indication externally to suggest where. I opened the abdomen in the middle line. The intestines were found intimately, though loosely, adherent to the under

surface of the peritoneum. The right iliac fossa
was examined, but nothing abnormal detected.
As the intestines in front, beneath the incision,
were glued together, they were gently separated
and withdrawn from the abdomen, when an abscess
cavity was reached situated deeply in the middle
line.   It contained a quantity of creamy fœtid
pus.   This, on being carefully swabbed out, exposed
the vermiform appendix, which, while free and
apparently healthy towards its cæcal extremity,
was fixed by its distal end to the floor of the
abscess cavity.   On detaching it an oval-shaped
perforation was discovered.   I need not pursue
the history of the case further.   The child made an
uninterrupted and complete recovery.

The other case was that of an elderly woman,
aged sixty-three years, a patient of Dr. Turner,
of Saltcoats, who, on account of the repeated attacks
of obscure cramp-like pains in the abdomen from
which she suffered, sent her to me at the Infirmary.
Her story was that for some twelve years she had
been troubled with pain which she associated with
the ingestion of certain foods.   The attacks would
seize her in the umbilical region, frequently make
her abdomen swell, and cause her to vomit.   Her
general health had failed, and she had lost flesh
considerably.   On admission she was free from
suffering, and looked, from her somewhat shrivelled
appearance, like a woman much older than her
years.   The abdomen was quite flaccid, and nothing
could be detected by external examination.   Her
motions appeared normal, and but for the history
which she gave, there was nothing to suggest that

there was anything much wrong with her. The unmistakable history, however, of her cramp-like attacks, together with Dr. Turner's opinion that there was something which gave rise to occasional seizures of temporary obstruction, I was led to advise an exploratory laparotomy. In order to enable me to obtain a better examination of the whole length of the colon I made a transverse incision of about three inches across the abdomen an inch below the umbilicus. On commencing my search in the right iliac fossa, I found it difficult to pull forward the cæcum, and discovered the cause to be an elongated adherent appendix. After separating several very intimate adhesions I was enabled to free it, and then found that it measured some six inches in length, with an acute flexion at the junction of the middle and outer thirds, and a distension of the distal segment to about the size of the little finger. An examination of the viscus after its removal showed it to be strictured at three separate places ; and while the tube proximal to the seat of flexion was empty, but somewhat dilated, that distal to it was packed with fæcal matter. The patient made a good recovery.

CHAPTER XIV

PAIN IN THE SIDE, EMBRACING THE HYPOCHON-DRIAC, LUMBAR, AND ILIAC OR INGUINAL RE-GIONS.

IT is not possible to draw any hard-and-fast line between the occurrence of pain in any one or other of these anatomical regions any more than, perhaps it should be said, it is possible to do so anywhere in or over the abdomen. All that can be said, however, is that pains usually and more distinctly felt in one region are less likely to have any very striking manifestations in another, although evidences of a slighter degree may be present. When it is further remembered that the lower dorsal nerves which supply sensibility to the skin and deeper parts of the whole side take a very oblique course, it can be well understood why pains, particularly, if not solely, of the " referred " kind, should extend over two or more of these anatomical areas.

Much that has been already said with regard to pains occurring in the anterior abdominal region might be repeated here, and the chapter should be read in conjunction with this one. The pains partake of the same characters, and are felt both deeply and superficially. As a rule, it may be taken that a pain experienced in some deep-seated situa-tion, and elicited by deep pressure, is indicative

of mischief connected with the organ or structure located at that particular spot. And while "referred" pains may also have a like suggestive value, yet they may in some cases indicate disease or functional derangement of some more distantly situated part. Bearing in mind, therefore, the various difficulties connected with the subject, and the impossibility of approaching to exactness in the differential interpretation of the various pains produced in these particular regions, I shall, nevertheless, attempt to classify the diseases which are most likely to be the cause of pain in one or other of them, and then seek to indicate such special characteristics in the seat and nature of the pain as may help to a correct diagnosis of the case.

DISEASES PRODUCTIVE OF PAIN LOCATED IN THE RIGHT SIDE.

(*Right Hypochondriac and Lumbar Regions.*)

SPINE.

    Lumbar abscess.

RIBS.

    1. Injuries.
    2. Caries.

LUNGS AND PLEURÆ.

    1. Pleurisy.
        a. Acute.
        b. Chronic.
            1. Tubercular
            2. Adhesions.
        c. Empyema.
    2. Pulmonary abscess.
    3. Growths.
    4. Pleurodynia.

LIVER AND GALL-PASSAGES.

    1. Inflammatory affections (as tabulated by Mayo Robson).

        a. Catarrhal inflammation.

            1. Acute catarrha cholangitis.

            2. Chronic catarrhal cholangitis.

            3. Chronic catarrhal cholecystitis.

        b. Obliterative cholecystitis and cholangitis.

LIVER AND GALL-PASSAGES—
(*cont.*)

1. Inflammatory affections,
   &c.—(*cont.*)
   c. Croupous or membranous inflammation of the gall-bladder and bile-ducts.
   d. Suppurative inflammation.
      1. Simple suppurative cholecystitis, or suppurative catarrh, or simple empyema of the gall-bladder.
      2. Suppurative and infective cholangitis.
   e. Acute parenchymatous or phlegmonous cholecystitis and gangrene of the gall-bladder.
   f. Ulceration of the gall-bladder and gall-ducts.
   g. Pericholecystitis and pericholangitis with adhesions.
   h. Stricture of the gall-bladder and bile-ducts.
   i. Fistula of the gall-bladder and bile-ducts.
2. Tumours of the gall-bladder (as tabulated by Mayo Robson).
   a. Distension of the gall-bladder.
      1. Distension with bile.
      2. Distension with concretions.

LIVER AND GALL-PASSAGES—
(*cont.*)

2. Tumours of the gall-bladder, &c.—(*cont.*)
      3. Distension with pus (empyema).
      4. Distension with mucus(hydrops).
      5. Distension with hydatid cysts.
   b. Hypertrophy and thickening of the walls of the gall-bladder forming a large, easily perceptible tumour.
   c. New-growths.
      1. Simple.
      2. Malignant.
3. Tumours of the bile-ducts.
   a. Distension.
   b. New-growths.
4. Gall - stones (loose or impacted).
   a. In gall-bladder.
   b. In cystic duct.
   c. In hepatic duct.
   d. In common duct.
      1. Supra-duodenal.
      2. Infra-duodenal.

DUODENUM.

1. Inflammation.
2. Ulceration.
   a. Simple.
   b. Malignant.
3. Stricture.
4. Growths.

KIDNEYS AND URETERS.

1. Inflammation (usually only with formation of pus).
   a. Solitary abscess.
   b. Multiple abscesses (" surgical kidney ").
   c. Pyelitis.
   d. Perinephritis.

M

KIDNEYS AND URETERS—(cont.)

2. Hyperæmia (acute).
3. Embolism.
4. Cystic disease (usually from largeness of size).
5. Hydated disease.
6. Hydronephrosis.
7. Tubercular disease.
8. Calculus.
9. Tumours.
    a. Simple.
    b. Malignant.
10. Stricture and kinking of ureters.
11. Displaced or floating kidney.

LARGE INTESTINE (see preceding list, p. 157).
Affections mostly in region of hepatic flexure and upper portion of ascending colon.

APPENDIX VERMIFORMIS (see preceding list, p. 158).
Usually in cases of undescended cæcum.

PELVIC ORGANS.—Female.
Affections of these parts mostly give rise to pains in the inguinal, iliac, and sacral regions, where they will be more fully discussed.

If we consider the subject from the point of view of probabilities, we shall most frequently find that pain in the loin is connected with some disorder of either the hepatic, renal or intestinal systems. Hence in all cases of obscurity, where, for instance, the direct cause of the pain and its special manifestation are not clearly obvious, it is well to take into consideration the viscera connected with these systems first. I intend, however, to treat the subject in the way that I have done in the preceding chapters when discussing the diagnostic significance of pain in other parts, and give, as succinctly as possible, the special points to be attended to in attempting to differentiate between the various causes productive of pain in these particular regions.

(1) The *sex* and *age* of the patient is of considerable importance. It is rarely that children complain of pain in the side ; and in adults it is a symptom more frequently met with in women than men. The chief reason of this is probably because women are more subject to the forms of hepatic trouble

that give rise to gall-stones; and while men, on the other hand, are more prone to certain renal affections and the formation of renal calculus, women are more often affected with movable kidney. If we exclude malignant disease, which selects neither one sex more than the other, women are more liable to functional and inflammatory disorders of the colon. Chronic constipation is often a source of constant inconvenience and annoyance, and when the cause of pain, is, in all probability, explained by the occasional drag of a loaded bowel upon the attachments of the meso-colon, and more particularly upon that segment of it which retains in position the hepatic flexure.

(2) The *previous history* of the patient may elicit facts connected with some pulmonary or pleural trouble: with attacks of jaundice; or with the passage of blood, pus, or gravel in the urine; any of which symptoms would sufficiently suggest the organs involved and the probable cause of the pain. A prolonged history of constipation, with increasing difficulty in obtaining an evacuation except by gradually augmented doses of an aperient, would suggest some functional derangement, abnormality or disease, of the colon.

The character of the pain is often of the greatest diagnostic significance. Thus it may be taken as a general rule that pains connected with hepatic diseases, among which are also included gall-stones and affections of the gall-bladder and gall-passages, radiate inwards and backwards, rarely downwards; while in renal affections, including renal calculi, the pains radiate mostly downwards and but rarely

upwards. Furthermore, it may be said that the most striking characteristic of the pains connected with calculi either of the renal or biliary class is their sharp, shooting, stabbing, pricking nature. In periods of quiescence, however, the pains may be more of the dull, heavy, deep-seated kind, and as such they may approach those of other affections of the same organs. Where the colon is in some way at fault the pain may be of a dragging, wearing or boring character, augmented frequently when an attempted evacuation takes place.

(3) The *examination* of the patient.—All physical examination of the loin should be carried out in three ways : first, with the patient in the recumbent dorsal position ; secondly, in the recumbent ventral position ; and thirdly, in the knee-elbow position. It may not be that all three positions will be necessary, but sometimes what one will fail to render manifest, another may make quite clear. By one or other of these positions any undue fulness or resistance can usually be detected ; and where not visible to the naked eye, single-handed or bimanual palpation may discover a deep-seated tumour or swelling. Percussion is of comparatively little value except in detecting dulness in the lower part of the pleural cavity, but even here such dulness may be normally hepatic. Pain, as elicited by direct pressure, must be considered from the two aspects of cutaneous hyperalgesia and a deeper-seated sensitiveness. When the skin is tender and over-sensitive, the pain may be of the " referred " kind, and as such have reference to more distantly situated organs or structures than those located directly in the regions

beneath. But these " referred " pains are usually associated with other more clearly marked symptoms indicating the part really affected. In pain, however, which is produced by deep pressure only, there is strong evidence in favour of the true mischief being situated at that particular spot.

The examination of the urine for blood, pus, tubercular bacilli, uric acid, oxalates, should be undertaken, especially in cases of suspected renal disease ; and where malignant disease of the colon or ulceration from any cause might be considered a possible source of pain, the motions should be examined from time to time for the presence of blood, mucus, or pus.

Lastly, it must be remembered that when no cause can be detected on the side in which the pain is felt, the opposite side should be carefully examined. For example, stone in the kidney has been known to cause pain on the side opposite to that in which the affected organ was situated (*see* Reno-Renal Reflex, p. 101).

DISEASES PRODUCTIVE OF PAIN IN THE LEFT SIDE.

(*Left Hypochondriac and Lumbar Regions.*)

STOMACH.

Mostly when the dome and splenic end are involved to some serious extent.

LARGE INTESTINE (see preceding list, p. 157).

Affections mostly in splenic flexure and upper two-thirds of descending colon.

KIDNEY AND URETER (see preceding list, p. 177).

SPINE, RIBS, LUNGS AND PLEURA (see preceding list, p. 176).

SPLEEN.

Mostly from enlargements.
1. Inflammation.
2. Malarial diseases.
3. Tumours.

All that has been said in connection with the seats and characters of pains on the right side, together with the points to be attended to in searching for the possible cause, equally applies to the present regions, and need not, therefore, be repeated. There are a few slight differences, however, in regard to the frequency with which disease attacks practically the same viscera on the two sides. Thus carcinoma is more frequent in the splenic flexure than the hepatic, and in the descending colon than in the ascending.* Dislocation of the right kidney is more frequent than of the left.

In connection with obscure pain in the left side, the following case is worthy of being recorded, and adds support to the value of an exploratory operation. The lady, aged fifty-four years, was a patient of Dr. Alice McLaren. For some three or four years she had been failing somewhat in health and strength, and more particularly so during the last nine months, when, as she stated, she began to lose flesh. Constipation had been a trouble with her all her life, but this too had increased latterly so that the employment of aperients had become a necessity. There had, however, at no time been any marked obstructive symptoms. Pain in the course of the descending colon had come to be a source of constant trouble, and relief was often obtained after an evacuation of the bowels. There was some vague history of an injury to the abdomen, but otherwise nothing was forthcoming to account for her indisposition. Her urine contained a per-

* See author's tables, p. 465. "The Surgery of the Alimentary Canal."

sistent trace of albumen. Physical examination of the abdomen was negative. I opened the abdomen over the course of the descending colon, and then found that the great omentum was attached for about four inches along the descending colon opposite to the insertion of the meso-colon. Thus the transverse colon and the descending colon appeared bound together by a broad membrane. This membranous attachment was so regular in its disposition and so vascular that it almost suggested some congenital abnormality, notwithstanding the history of a previous injury to the abdomen. It was ligatured in four separate places and divided. The stomach and pylorus, the left kidney, the pelvic viscera, and the remaining portions of the colon were all carefully examined, but beyond the lesion described there was nothing else of a diseased or abnormal character to be detected. The patient made an uninterrupted recovery, and remains, now over two years since her operation, in good health and free from pain.

This case fairly illustrates one of possibly a large class, where obscure colicky pains are due to the hampering effects of internal adhesions. If the gut is not kinked, it may be dragged upon in such a way that every time peristalsis takes place, either there is some interference to the free onward passage of the bowel contents, or the drag itself upon the tunics is directly the source of the discomfort.

DISEASES PRODUCTIVE OF PAIN IN THE RIGHT INGUINAL AND ILIAC REGIONS.

CÆCUM, including lower end of ileum, ileo-cæcal valve, and first portion of ascending colon.
1. Inflammation.
    a. Acute cæcitis.
    b. Acute catarrhal cæcitis.
    c. Chronic catarrhal cæcitis.
2. Ulceration.
    a. Stercoral.
    b. Tubercular.
    c. Typhoid.
    d. Malignant.
    (See also preceding list, p. 157, for other affections of large intestine.)

APPENDIX VERMIFORMIS (see preceding list, p. 157).

KIDNEY AND URETER (see preceding list, p. 177).

BLADDER AND PROSTATE (see preceding list, p. 159).

UTERUS, embracing both body and cervix.
1 Menstrual derangements.
2. Inflammation.
    a. Acute.
        1. Endometritis.
        2. Endocervicitis.
        3. Metritis.
    b. Chronic.
        1. Endometritis.
        2. Endocervicitis.
        3. Metritis.
            a. Septic and saprophytic.
            b. Gonorrhœal.
            c. Tubercular.
            d. Diphtheritic.
3. Fibroids (Myomata).

UTERUS, &c.—(cont.)
4. Displacements.
    a. Prolapse.
    b. Flexions and versions.
    c. Adhesions.
5. Polypi.
    a. Simple.
    b. Placental.
6. Carcinoma.

OVARY.
1. Inflammation.
    a. Acute ovaritis.
    b. Suppurative ovaritis.
    c. Chronic ovaritis.
2. Sclero-cystic disease.
3. Cirrhosis.
4. Tumours.
    a. Cystomata.
        1. Innocent.
        2. Malignant.
    b. Solid.
        1. Innocent.
        2. Malignant.
5. Displacements.
    a. Prolapse.
    b. Adhesions.
6. Ovarian pregnancy.
7. Hernia.

FALLOPIAN TUBE.
1. Inflammation.
    a. Salpingitis, interstitial salpingitis, perisalpingitis.
    b. Suppurative salpingitis, gonorrhœal (pyosalpinx).
    c. Tubercular.
    d. Dropsical (hydrosalpinx).
2. Hæmato-salpinx (tubal gestation).

FALLOPIAN TUBE—(cont.)
3. Adhesions.
4. Tumours.
    a. Innocent.
    b. Malignant.

BROAD LIGAMENT.
1. Varicocele.
2. Tumours.
    a. Innocent.
    b. Malignant.

PELVIC INFLAMMATION.
1. Peritonitis.
2. Cellulitis.
3. Adhesions.

PSOAS ABSCESS.

PSOAS MUSCLE, inflammation of.

ANEURISM OF EXTERNAL ILIAC ARTERY.

INTRA-PELVIC PARIETAL TUMOURS.
1. From bone.
2. From soft tissues.

ALCOHOL (Herman).

INCOMPLETE SEXUAL INDULGENCE (Herman).

NEURASTHENIA.

HYSTERIA.

CHRONIC RHEUMATISM.

Few regions, the seat of acute, subacute or chronic pains, have attracted more attention than the right inguinal region. The reason is not far to seek, for it is in this region that the vermiform appendix is most frequently situated, and it is in this region (together with that of the opposite side) that " referred " pains are felt in connection with diseases and functional derangements of the female reproductive organs. Until abdominal surgery had brought to light the many affections of the appendix and cæcum capable of causing pain in this region, surgeons had been in the habit of associating these painful manifestations in the female with ovarian disease, or some affection of one or other of the reproductive organs. So common was this association, that it doubtless explains the origin of the term " ovarian pain " which came to be applied to most pains arising in this region. The recognition of another source, and that a not infrequent one, in affections of the vermiform appendix has, with little less doubt, led to the too frequent assumption that this viscus

was at fault, and "appendicular colic" came to be
applied, if not to supplant, the older term of "ovarian
pain." The practical outcome has been that many
a patient has had the appendix removed when the
ovary or Fallopian tube was at fault, and the ovary
or tube when the appendix was to blame. And
the interesting point about the matter is that the
removal of the one or the other has often been
determined, not so much on a proper appreciation
of the collateral symptoms, as on some special
proclivity on the part of the operator. To the
gynæcologist, whose training in general surgery
has probably been practically nil, pains in the in-
guinal region are more likely to be construed as
manifestation of mischief connected with parts
that his time and attention are exclusively devoted
to, than as indications of disease elsewhere. While,
on the other hand, there is the equal danger that the
general surgeon, whose knowledge of gynæcology
may be but slight, will wrongly construe these same
pains as an exhibition of symptoms pointing more
to intestinal and appendicular trouble than to
affections of the pelvic organs ; and the more so
if he is one who has become too smitten with the
appendicectomy craze. It is the necessary evil conse-
quent on a too rigid specialisation in what can only
be justly termed separate departments of general
surgery, but departments which so frequently overlap,
that the study of one is as important as a proper
knowledge of the other. There is more, however,
in this subject than what I have just said, for it
sometimes happens that the question is not simply
one of disease of one organ or the other, but the

involvement of more than one. Thus, we now know from our operative work that disease which is causing the so-called " ovarian" or "appendicular" pain may be caused by a conjoint involvement of both appendix and ovary, or appendix and tube, or even all three. That this association should sometimes exist is sufficiently explained on purely anatomical grounds, and is probably considerably predisposed to by a downward and inward disposition of the appendix. As lymphatics pass between the layers of the appendiculo-ovarian ligament, the two organs are brought into intimate association by means of these vessels. Should, therefore, inflammation attack one, it is not difficult to see how easily the other may be infected. Indeed, it seems not unlikely that the return of pain in certain cases where one diseased organ has been removed is due to a similarly diseased condition of the other left behind.

While I have thought it right to draw special attention to these particular organs—the appendix, the ovary, and other female pelvic viscera, I do not wish to detract unduly from a full and proper consideration of all the possible causes of pain in this particular region. Indeed, it is only by approaching their consideration with a most open mind, and a sufficient regard for every diseased condition or functional derangement capable of producing the particular symptom under discussion, that a correct diagnosis will be formed and proper treatment carried out. I shall, therefore, now consider the subject along the same lines that I have hitherto adopted, and indicate the particular points to be

noted in seeking to solve the differential significance of pain in this region ; in other words, to arrive at some idea as to the organ or structure causing the pain, and the possible character of the disease or derangement implicating it.

The *age* and *sex* of the patient are, as in all other cases of abdominal pains, general or local, important in assisting to arrive at a correct diagnosis. In children, iliac pain is, with very few exceptions, due to some intestinal trouble, and attention should be first directed to the nature of the ingesta and to the condition of the motions. Should these indicate nothing, it is probable that the appendix vermiformis is at fault. It has certainly become surprising to know how many children, from the age of five years or so and upwards, are subject to appendicæcal affections. In women, and more particularly young adults, and in the early years of married life, attention must be directed to the reproductive organs. In older women, as also in men passed the middle period of life, carcinoma of the cæcum or ileo-cæcal valve is a likely cause, but appendicæcal complications must not be overlooked. In men renal " referred " pains, from calculus either in the kidney or ureter, are to be thought of ; but the possibility of other renal affections in women must also be remembered. Bladder complications are equally common in both sexes, and pain may be present from vesical calculus in children. Tubercular ulceration of the cæcum attacks both sexes alike, and is mostly met with before middle life. Typhoid ulceration, while certainly a cause of pain in enteric fever, is not

infrequently, I believe, a mistaken diagnosis for what is really an attack of appendicitis. I can recall at least two cases that have come under my own personal observation where, from the occurrence of subsequent attacks of typical appendicitis, there was little doubt that the initial attack was not, as diagnosed at the time, enteric, but the first of a series of acute and sub-acute attacks of appendicitis. There is this, however, to be said, that there is no reason why an attack of enteric fever, involving in its ulcerative lesions the appendix, should not prove a primary cause for subsequent attacks of true appendicitis. The mere fact of the ulceration having left a stricture, a kink, or adhesion in its train would be quite sufficient an incentive for the production of attacks of pain, if not actually of inflammation, acute or chronic.

Lastly, women, who are more subject to constipation than men, sometimes suffer pain in this region from the effects of an overloaded colon. It would seem that, to whatever cause the loading of the colon may be due, it is upon the cæcum that the greatest pressure is brought to bear, and that the results of fæcal stagnation are here observed in irritation that may cause either simple catarrh or actual ulceration (stercoral ulcers).

(2) The previous *history* of the patient will frequently give the best clue to the probable cause of the pain, or rather to the particular organ the disease of which is its origin. Thus a vaginal discharge of some standing would suggest the possibility of an inflammatory condition of the Fallopian tubes or uterus. Any derangement of the menstrual

function would equally lead to a suspicion of one
or other of these same organs being at fault.   The
occasional or constant presence of blood, pus, or
" sand " in the urine should call for a general over-
haul of the urinary system, including kidney, ureter,
bladder and prostate.   A tubercular history in the
family, or the manifestation of old lesions on the
patient, are, when taken in conjunction with the
possible presence of other bowel symptoms, sugges-
tive of tuberculosis of the cæcum or ileo-cæcal
valve.   A history of prolonged constipation may
mean a perpetually overloaded colon ; while con-
stipation of more recent date, with increasing
need for the employment of augmented doses of
an aperient, points to some organic obstructive
cause—not unlikely malignant disease.   In some
patients it would seem that the ingestion of certain
foods lead to slight attacks of mucous colitis, or
more locally, cæcitis, with the passage in the stools
of small quantities of mucus.   While such a cause
might lead to extension to the lining membrane
of the appendix and initiate a true attack of appen-
dicitis, it is probable that, so long as the patient
takes due care in the matter of food, no such untoward
result need be feared.   From a point of diagnosis,
however, the more or less constant association of
pain with the ingestion of certain foods may fairly
lead to the assumption that the mischief is localised
in the cæcum, with possibly sometimes also the appen-
dix.   Constitutional affections, such as neuroses,
and rheumatism, should be examined for.

(3) The *examination* of the patient. — The
visible as well as the tactile perception of a swelling

in the iliac region is sufficient evidence that the pain complained of is connected with some definite mischief located there.   On the other hand, the evidence of no such obvious and tangible manifestation, while it does not eliminate the possible existence of trouble in the region, suggests the greater likelihood that the pain is " referred," and has as its incentive, mischief located in one or other organ more or less remotely placed, but nevertheless capable of evoking the pain.

In the case of a swelling, the chances are greatly in favour of its connection being in some way with the cæcum or appendix; the more so is this probable if, coupled with this swelling, there is marked tenderness on pressure and constitutional symptoms of fever.   As to its nature under these latter conditions, the likelihood is that there has been pus formation.   Many other considerations are necessary in order to determine the possible primary cause—whether from mischief connected with the appendix, or as a sequel to ulceration in the cæcum, from chronic constipation, tubercular, or malignant disease.

In cases where deep pressure causes pain, and yet where no other physical evidences are present, there is still the possibility of the trouble being connected with these same parts of the intestinal tract.   Thus adhesions, the remnants of a passed inflammatory attack, may not only in themselves originate pain, but be the source of its invocation under pressure.   Also inflammation of the cæcal mucous membrane with some catarrhal ulceration, will in like manner produce pain.   From a case

which came under my observation, and in which no local inflammatory cause was detected, I am inclined to believe the pain arose from a hyper-distended condition of the cæcum with fæces, due to chronic obstructive constipation. The case is worthy, I think, of being recorded, as adding another possible cause to the many which are already known to exist in causing troublesome constipation. Its introduction here also is quite opportune, because one of the symptoms which was present was occa-sional attacks of pain in the right iliac fossa. Indeed, it was owing to repeated attacks of pain in this region that a diagnosis had been made, by those whom the patient had already consulted, of probable attacks of recurrent appendicitis.

The young lady, aged twenty-nine years, was a patient of Dr. Elizabeth Pace, who asked me to see her with a view to an exploratory operation. The history of her illness was that, while enjoying good health up to ten months ago, she at this time com-menced to be troubled with her bowels. Regular until that period, they now began to be confined, and she found it necessary to take aperients in order to obtain a movement. Latterly the strength of the aperient had to be increased, and if an evacua-tion was not obtained for four or five days, pain was experienced, and came on in spasms. These attacks of pain increased until one was usually experienced once a week, and frequently they were of considerable severity. Injections, when used, had also come to cause pain. Examination of the abdomen revealed a sense of resistance in the right iliac fossa and pain on deep pressure. Extreme

flexion of the thigh upon the abdomen also produced pain in the same region. I opened the abdomen as for an appendicectomy, the cæcum was distended with fæces, but otherwise nothing abnormal was detected. The appendix, though free, and to the naked eye, quite healthy looking, was removed. The cæcum was opened and found packed with fæces, on removal of which a perfectly healthy mucous membrane revealed itself. The ovary and Fallopian tube of the affected side were then examined and found healthy, but in making this part of the investigation it was found that the omentum and transverse colon were stuffed down in the pelvic cavity, apparently filling Douglas's pouch. As it seemed quite fairly possible that this abnormal disposition of the transverse colon was the explanation of the chronic constipation, by damming back the fæces and distending the cæcum, I decided to perform colopexy. A small transverse incision was made about three centimetres above the umbilicus, and the meso-colon, close to its attachment to the bowel, fixed by a few sutures to the abdominal parietes. The patient made a good recovery, and when last heard of, three months after the operation, had greatly improved in her general health and was quite free of the old iliac pains.

It would not be out of place to couple with this case others of a similar nature, where chronic constipation is now known to be due to obstruction at either one or other of the two colonic flexures—the hepatic and splenic. Why these two places should occasionally be the cause of obstruction in otherwise perfectly healthy subjects it is not possible

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to say, except on the purely anatomical grounds of a too short suspensory ligament, whereby the otherwise normal bend becomes an abnormal kink. But a discussion of this subject would carry me beyond the bounds of my object, which is merely to point out that constipation, from practically functional and not diseased conditions, may sometimes lead to pain in the iliac region, as well as vague cramp-like or colicky pains in other parts of the abdomen.

Reverting now to other differential considerations in the examination of the patient, if there is reason to suspect, from the superficial tenderness of the skin, that the pain complained of is of the referred kind, then regard should be had in the case of the female to the reproductive organs. And here it may be pointed out that when the " referred " pain indicates affections of the ovary, the area of tenderness is along the distribution of the nerves of the tenth dorsal segment, that is to say, in an upward direction from the iliac region towards the umbilicus. The maximum point of sensitiveness is a little below and to one side of the umbilicus, at that spot which it is usual to speak of as the seat of " ovarian pain." On the other hand, implication of the Fallopian tube causes an area of tenderness along the nerve distribution of the eleventh and twelfth dorsal segments, so that the skin is found to be tender more strictly in the iliac region, and not extending upwards so far towards the umbilicus. It must, however, be remembered that in nearly all purely inflammatory affections of the uterus and adnexa no such differentiation will be possible,

as the involvement of one—and more particularly in the case of either the ovary or the tube—means an implication of the other. As far, therefore, as the examination of the patient goes, the suggestiveness of the pain can only be converted into certainty by digital or visual exploration of the vagina and rectum.

An examination of the urine may reveal indications of the pain being caused by some renal or ureteral condition. That possibly the kidney or calculus may be the cause, notwithstanding the absence of other more typical signs, is well illustrated by two cases that are known to me. In one a diagnosis had been made, from the recurring seizures of pain in the right inguinal region, that the patient was suffering from attacks of chronic appendicitis. At the operation a perfectly healthy appendix was found and removed. The patient recovered from the operation, but the pain returned, and then of a more suggestive character, shooting down from the loin to the iliac region. It was subsequently ascertained that he had calculus of the kidney. In the other the patient also suffered from attacks of severe pain in the right iliac region. In this case there was a distinct fulness and tenderness in the right iliac fossa. The patient was considered a subject of acute appendicitis, and treatment was adopted accordingly, when it was found that the swelling was due to a hydronephrotic kidney.

DISEASES PRODUCTIVE OF PAIN IN THE LEFT INGUINAL OR ILIAC REGIONS.

SIGMOID FLEXURE.
1. Carcinoma.
2. Inflammatory affections common to other parts of large intestine (see preceding list, p. 157).
3. Polypus (often multiple polypi).

RECTUM.
Usually from some obstructive cause.

PELVIC VISCERA of both Male and Female (see preceding list, p. 184).

APPENDIX VERMIFORMIS.
Usually " referred " from the right side. The remaining diseases given in preceding list, p. 184, of other organs and structures.

All that has been said with regard to the causes of pain in the right inguinal or iliac region might with equal force be repeated here. The principal difference lies in the segments of bowel occupying the similar situations, the sigmoid flexure taking the place of the cæcum, ileum, and appendix. The rectum tending to deviate towards the left, and being a direct continuation of the sigmoid, places this part of the intestinal canal in the category of parts capable of causing pain in the region.

The fact probably of most clinical importance to remember is the frequency with which appendicular pain is felt on the left side, although the affected organ occupies its normal position on the right. The pain is, of course, in these circumstances, " referred." It must, however, be stated that cases have been reported where the appendix has been located in the left iliac fossa.

In diseases and derangements of the female reproductive organs, pain is often more frequently felt on the left side than on the right. In explana-

tion and illustration of this I may quote the remarks
of Dr. Herman, in his paper before the British
Medical Association,* introducing the discussion
on so-called "ovarian pains." He states : "One
feature of pain due to, or increased and extended
by the breaking down of resistance in the higher
centres, is that, owing to the lesser strength of the
left side of the body, pain is more common on the
left side. Champneys† found that in uterine cancer
left-sided pain preponderated over right-sided pain
in the proportion of six to one, although cancer
has no preference for the left side. I found‡ that
with retroversion of the uterus pain occurs three
times oftener on the left side than on the right,
although there is nothing unilateral about the
displacement."

* *British Medical Journal*, 1904, vol. ii. p. 1056.
† *Obstet. Trans.*, vol. xxii. 1880.
‡ *Ibid.* vol. xxxv. 1893.

CHAPTER XV

PAIN IN THE BACK—DORSAL, LUMBAR, AND SACRAL REGIONS

THE posterior wall of the abdomen is strictly formed by the spinal column in the middle line and the lumbar muscles on each side, constituting the regions usually understood as the "loins." In a more extended sense the pelvic cavity is included, and the posterior wall, therefore, embraces the sacrum below. While these are the parts which the limits of the subject should only comprise, the distribution of "referred" pains renders it necessary to include a considerable part of the dorsal region. I propose, therefore, to divide the back into three segments; the dorsal, reaching from between the mid-scapular region to the first lumbar; the lumbar, embracing the area of the five lumbar vertebræ; and the sacral, comprising the area occupied by the os sacrum. This division, as can well be understood, must be a purely arbitrary one, for no hard-and-fast lines can possibly be drawn between pains occurring in one or other segment. Here, as elsewhere, and as has been previously indicated, pain may diffuse itself over more than one anatomical area, although the guiding feature in nearly all cases of referred pains is the seat of the most marked pain and tenderness.

It may be taken as a general fact of some little

clinical significance that physical examination of the back will more often than not fail to elicit the actual seat of the disease. The reason of this is, of course, that the majority of the pains felt in the back are " referred," and therefore simply reflected indications of disease in more remotely situated organs.

Inasmuch, therefore, as " referred " pains are only secondary manifestations, they are, as a rule, corroborative rather than of themselves indicative of the disease suspected ; that is to say, helpful in confirming what other symptoms with greater force and clearness suggest.

In all examinations of the back the patient should, if possible, be placed first in the prone position, with the arms folded across for the forehead to rest upon. In this position the spine and lateral parts can be viewed, palpated and percussed. As a second method of examination the patient should be made to stand erect, and then exercise various movements of flexion, extension and rotation. When little can be gained by such an examination, the probabilities are that the pains complained of are of the " referred " kind, and attention should then be directed to the detection of special areas of cutaneous hyperalgæsia. But, as already indicated, when the pain is of the " referred " kind, the examination of the areas of cutaneous hypersensitiveness will usually follow, rather than precede, the investigation of other symptoms more pointedly significant. Adopting the course hitherto employed in discussing regional pains, I will first give a list of the diseases and functional derangements likely to cause pain in

some part of the back, and then describe the special points to be attended to in seeking to ascertain the possible organ or structure involved and the disease or derangement with which it is affected.

DISEASES PRODUCTIVE OF PAIN IN THE BACK.
(*Dorsal Region.*)

SPINE.
  1. Tubercular (caries).
  2. Osteo-arthritis.
  3. Carcinoma.
    a. Primary.
    b. Secondary.

SPINAL CORD AND MEMBRANES
  (see preceding list, p. 158).

MUSCLES AND SHEATHS.
  Chronic Rheumatism.

ŒSOPHAGUS.
  1. Inflammatory affections.
  2. Carcinoma.
  3. Impacted foreign bodies.
  4. Chronic ulcer.

STOMACH.
  Gastric ulcer (for other possible causes, see preceding list, p. 157).

LIVER, GALL - BLADDER AND BILE-PASSAGES.
  Calculus (for other possible causes, see preceding list, p. 176).

PANCREAS.
  1. Acute pancreatitis.
  2. Carcinoma.
  (See preceding list, p. 158.)

COLON.
  Chronic Constipation.

AORTIC ANEURYSM (Thoracic).

MEDIASTINAL TUMOURS.

PULMONARY AND PLEURAL AFFECTIONS.

DORSO-INTERCOSTAL NEURALGIA.

In most affections of the spinal column and spinal muscles there is voluntary restriction of movement, and any forcible endeavour causes pain, frequently most marked, at the seat of greatest mischief; still further, pressure or percussion over the affected area increases the pain. On the other hand, complete rest usually mitigates, if it does not completely remove, all discomfort.

Secondary involvement of the vertebræ by erosion from aneurysm, tubercular disease, and malignant growth is, however, a constant source

of pain, quite irrespective of any impairment of movement of the part. I once saw a patient with carcinoma of the breast whose sufferings were mostly centred in constant pain in the back. After death, numerous secondary deposits were found in the bodies of the vertebræ. Erosion of the bodies of the vertebræ by aneurysm usually causes a fixed and boring pain, and tends to radiate in the course of the intercostal nerves when these are pressed upon or irritated.

The pains arising from carcinoma of the œsophagus and other affections of the gullet are felt mostly opposite the seat of disease, and are augmented during the process of deglutition. In marked obstruction, the patient usually complains of a spot where the food seems to stick. It sometimes happens, however, that spasm of the œsophageal muscles is evoked above the seat of the disease, and the pain is referred to a point higher up than the actual seat of the mischief. Pains arising from carcinoma or stricture of the gullet at its cardiac end merge themselves into those equally significant of gastric disease.

In diseases of the stomach, those which cause ulceration are the most likely to produce dorsal pains. These pains are not markedly characteristic, being sometimes little more than a burning, pricking, or gnawing sensation, evoked generally by taking food. They are felt about opposite the spinous process of the fifth dorsal vertebra in an area which lies between and at the lower part of the scapulæ. Tenderness is elicited by palpation of the skin supplied by nerves coming from the seventh, eighth,

and ninth dorsal segments (Head; *see* Figs. 8 to 11, pp. 43–46). In some cases the pain circles round on the left side from the back to the epigastrium in front.

In biliary calculus the pains are often of a very typical character, partaking of the sharp, shooting, lancinating kind. The seizures usually appear without any warning, and often from no known special cause; although some instances will be met with where exertion or food seems to have been the incentive to their appearance. The pain is felt mostly in the right scapular region, having extended round from the right hypochondrium; but in some cases the pain radiates to the left shoulder. The area of skin-tenderness is in the course of distribution of the nerves coming from the eighth dorsal segment (Head; *see* Figs. 8 to 11, pp. 43–46).

The affections of the pancreas most liable to produce pain in the back are acute pancreatitis and advanced carcinoma of the organ. The pain, which may be of a dull, aching, boring, lancinating, or wearing character, is felt mostly in the mid-scapula region. In some cases of malignant disease it is felt worse at night.

Sir James Sawyer * has drawn attention to a cause of pain in the lower dorsal region arising from an overloaded colon. "I find," he says, "that patients complain of a pain, aching, dull, and heavy in character, and extending right across the back; when asked to point out its position, they indicate this by carrying the hand behind

* *Lancet,* 1887, vol. i. p. 17.

the trunk and drawing the extended thumb straight across the back in a transverse line, about half-way between the inferior angles of the scapulæ and the renal region. . . . I have found it disappear after the exhibition of an efficient cathartic."

DISEASES PRODUCTIVE OF PAIN IN THE BACK.
(*Lumbar Region.*)

SPINE (see preceding list, p. 200).

SPINAL MENINGITIS.

MUSCLES AND SHEATHS.
    1. Lumbago.
    2. Chronic rheumatism.
    3. Muscle exhaustion.

KIDNEYS AND URETERS (see preceding list, p. 177).

BLADDER AND PROSTATE (see preceding list, p. 159).

TESTES AND SPERMATIC CORDS.
    1. Varicocele.
    2. Spermatorrhœa.

COLON (see preceding list, p. 157).

APPENDIX VERMIFORMIS (see preceding list, p. 157).

RECTUM AND ANUS.
    Hæmorrhoids.

UTERUS, OVARIES AND TUBES (see preceding list, p. 184).

AORTIC ANEURYSM (Abdominal).

NEUROSES.
    1. Asthenia.
    2. Lumbo-abdominal neuralgia.
    3. Neuritis.

FEVER (from any cause).

ANÆMIA.

GOUT.

SMALL-POX.

INFLUENZA.

Pains in the lumbar region of the back are far more common than those occurring either above or below, and in one sense more significant ; for it not unfrequently happens that the patients' sole complaint, or at least their most troublesome symptom, is pain in this region. It being also the true posterior wall of the abdominal cavity, it is anatomically the situation where referred manifestations of intra-abdominal disorders are most likely to reveal themselves. A glance at the above list shows how many are the organs

and structures, the diseases or derangements of which are liable to produce lumbar pains. In many these pains, for diagnostic purposes, are of secondary importance, inasmuch as more significant and suggestive symptoms are present elsewhere—in the region, it may be, of the organ or structure involved. But there are others where a proper appreciation of the symptom is of primary importance, and may be the sole means of leading to a correct diagnosis. It is more with this class of cases that I intend to deal than with those where the symptom is simply corroborative. In order to examine the region, the patient should be placed in the positions already described in investigating the dorsal segment (*see* p. 199).

Following the order in the list as above given, affections of the spine may sometimes cause pain as an initial symptom when there are no other indications of disease to be detected elsewhere. This was strikingly illustrated in a case which came under my observation some years ago in the wards of the Victoria Infirmary. A man, aged about thirty-five years, was admitted for occasional attacks of pain in the lumbar vertebræ. A careful examination of all parts likely to produce the symptom proved negative ; and as the man seemed to improve by rest he was dismissed after a week or two to return if he got worse. He presented himself some few months later with a well-marked lumbar abscess and some slight projection of a lumbar spinous process. His original pain, therefore, was clearly shown to be commencing caries in the bodies of the lumbar vertebræ. In men and

women passed middle life, pain and stiffness of the spine may be due to osteoarthritis, the development and growth of osteophytes locking and impeding the action of the joints and processes of the column.

Many a so-called " back-ache " from which adults of both sexes complain is to be traced to some kind of muscle derangement. And it is not difficult to understand why this should be so, for the large spinal muscles which are located on each side of the column have to support and maintain in equilibrium the whole of the trunk above. If, therefore, the sheaths of these big muscles become inflammated in chronic rheumatism or gout, any movement must necessarily be associated with pain, and the familiar " lumbago " is likely to result as an attack of the more extreme order.

Over-exertion and want of sufficient rest, especially in anæmic or otherwise reduced women, is a very fruitful source of back-ache. Muscle exhaustion may be considered from several aspects. In some, it doubtless arises from a too great strain on the nervous system, especially in cases of over-sexual indulgence, where, as a result, there is a general depletion of nerve force to all structures, and in none is this felt more than in the great muscles of the trunk in the loin. A somewhat similar result accrues in women suffering from a too frequent and too abundant menstrual discharge ; and, indeed, from any cause, constitutional or otherwise, which reduces the quality of blood or the proper forces of the nervous system. In spermator-rhœa a tender spot is sometimes complained of in the lumbar spine. Weak-looking young girls some-

times complain of pain in the back, which they say is always worse in the morning. One possible explanation of this is the shape of the bed upon which the patient sleeps. In drawing attention to this cause, Mr. William Square * points out that " the bed so sinks down under the superincumbent weight that the patient is always lying with the back bent and the whole of the posterior muscles of the spine pulled out to the utmost stretch." The remedy, as he indicates, is very simple—the placing of a small pillow in the " small of the back " in order to give the necessary support.

When pains in the back and loins are " referred," there are many sources from which they may arise. When due to kidney or ureteral conditions, it is frequent to find that the pains seem to have a starting-point in the region and extend downwards. In character they may be acute and spasmodic, or dull and aching. Pains referred from the bladder, prostate, testes, or spermatic cords are usually of the subacute kind, amounting often to little more than a sense of weakness in the loins.

Diseases of any part of the rectum or anus may cause pain in the lumbar region, and in this connection the existence of hæmorrhoids should be remembered.

In women one of the most fertile sources of pain is found in the various diseases and derangements of the reproductive organs. And there is a twofold reason why they should be such frequent sufferers in this respect ; for many of the affections become not only causes in themselves of referred pains,

* *British Medical Journal*, 1887, vol. i. p. 229.

but they so reduce the general constitution of the patient that from this cause also the lumbar muscles and ligaments are weakened and fail to give the necessary bodily support. Hence, any over-exertion, indeed mere exercise itself, causes a sense of weariness and aching in the lumbar region. Whether, however, the pains complained of—and there is nothing specially characteristic about them— are due to pelvic derangements or not can only be determined by a proper physical examination of the different organs and structures likely to be involved.

It occasionally happens that pain in the right side is connected with affections of the appendix. The explanation of this is invariably to be found in the location of the organ upwards and behind the cæcum. Tenderness and pain in this region usually means, when arising from the appendix, that inflammation and possibly pus-formation is in process. On the other hand, these same symptoms may be associated with similar processes taking place in connection with perinephrosis, pericolitis on either side, and perityphlitis, arising from whatever cause.

Aneurysm of the abdominal aorta, by eroding the spine, will give rise to pains of a burning, boring character, radiating laterally in proportion to the amount of involvement of the nerves.

The pains accompanying fevers and other grave constitutional disorders are merely secondary, and have practically little or no diagnostic value. They are " part and parcel " of the same pains which more or less attack all the muscles and connective tissues; and, owing to the magnitude of the muscles in the loin and the important functions they have

to perform, are probably more severely felt in this region.

DISEASES PRODUCTIVE OF PAIN IN THE BACK.
(*Sacral Region.*)

SACRUM.

  1. Caries.
  2. Tumours.
    a. Innocent.
    b. Malignant.
    c. Congenital (der-
        moids).

SACRO-ILIAC SYNCHONDROSIS.

  Inflammation.
    a. Acute infective.
    b. Tubercular.

RECTUM AND ANUS.

  1. Fæcal distension and
    impaction.
  2. Carcinoma.
  (See preceding list, p. 146.)

BLADDER AND PROSTATE (see preceding list, p. 159).

UTERUS (see preceding list, p. 184).

SPINAL MENINGITIS.

With the exception of the diseases directly connected with the sacrum and the sacro-iliac synchondrosis, the pains in this region are almost entirely "referred"; and in the case of women, are invariably traceable to some implication of the pelvic reproductive viscera. When the pains arise from pressure upon or actual invasion of the anterior sacral nerves, they are severe and radiate frequently in the course of the branches of the sacral plexus. Thus, shooting or cramp-like pains may be felt extending down the back of the leg, taking the distribution of the sciatic nerves. Some of the most excruciating pains felt in the sacrum owe their origin to the invasion of the posterior pelvic wall by advanced carcinoma of the rectum.

As a matter of diagnostic value, sacral pains are of little worth, inasmuch as other symptoms more prominent and more suggestive usually exist. The exception, however, is in the case of the female

pelvic viscera, where the pain may be the most prominent factor, and it is only on a careful examination of these organs that the discovery of the true cause is made.

That pressure may be exercised upon the nerves, by a rectum distended and loaded with hard fæcal masses, should be remembered.

CHAPTER XVI

THE OPERATION OF LAPAROTOMY—STERILISATION OF OPERATOR'S HANDS, AND PATIENT'S SKIN: LIGATURES AND SUTURES.

THE subject of treatment was not intended to form any part of the present work, and so far I have said nothing regarding it, except to indicate frequently how much we have come to know through the intervention of abdominal surgery; and how much we may hope to accomplish by the timely employment of this branch of our art in dealing with certain diseases. I intend, however, to conclude with a chapter or two on certain practical points connected with abdominal operations.

To say that I have opened the peritoneal cavity by a more or less free incision through the anterior abdominal parietes over five hundred times, is not to pretend that this number in itself presents anything remarkable. My sole reason for making the statement is, that it may be some justification for my venturing to essay certain opinions and words of advice in connection with the performance of these operations. And in attempting even to do this, I am fully conscious that my experience, limited as it may seem to some, is not sufficient to permit me to speak dogmatically, much less to pose as a teacher. No man, probably, carries

out a particular scheme or line of action so perfectly as he who has propounded it. Because *he* is the originator, he, therefore, attends to all his little details, and exercises that patience and takes that trouble which alone ensure success.

If, then, I succeed, and am satisfied with my results, it is not that I consider my methods necessarily better than those of others, but that I attend to all those little points of detail in the scheme of operating which I have carefully thought out, and learnt to regard as important for the acquisition of success in my own hands.

If any one, therefore, would wish to follow on the lines which I have laid down for my own course of action, I would ask, in the first place, that he accept and thoroughly appreciate the reasons given for any departure I may make from more generally recognised procedures ; and in the second, being duly impressed with the significance of these reasons, he pays all due regard to every item of detail considered necessary in the performance of an operation.

I do not intend to describe the operation of laparotomy in the way that the student would be expected to know it for his examination. I am merely going to emphasise certain special points of practical interest ; and in giving my reasons for particular steps taken, leave it to the judgment of any to decide whether they consider the course pursued better than other plans with which they are more familiar. I may, likely enough, leave out of consideration that which some might deem expedient to enforce, and equally emphasise that which others might regard as superfluous. But

what I inculcate I do on personal experience; and the personal element, after all, is no mean factor in the satisfactory accomplishment of any and all work. If I attain success where others working along the same or similar lines fail, or *vice versa*, the methods may not be at fault, but the personal equation may be the real determining factor in the issue.

In attempting, then, to solve the many problems, to overcome the many difficulties, and to be equal to the many emergencies, and I may add surprises, which the abdomen has in store for those who undertake to deal with its contents, success or failure may not depend so much upon the rigid adherence to certain rules, or the execution of certain details— all important as these are—as upon the personal fitness and aptitude of the operator.

With these few preliminary remarks I shall now describe ·in detail the particular points that have appealed to me as of importance in the operation of laparotomy.

(1) The **Sterilisation** of the **Operator's Hands.** —That infection of the wound is possible by the skin of the operator's hands has long been recognised as a source of mischief to be most scrupulously guarded against, and innumerable have been the methods practised to attain this end. I have no intention of discussing the relative merits of these various methods, beyond making the bare statement that, however efficient a method may prove in rendering the hands sterile and proof against the most exacting experimental tests, the process is a valueless one, unless it entails that the hands

remain *throughout* the operation as aseptic as they were proved to be at the *commencement*. I have always felt, rightly or wrongly, that the evils of infection by the hands were as likely, indeed if not more so, to take place in the later stages of the operation than at the beginning. In other words, that in difficult and prolonged abdominal operations, when after a time the skin of the hands begins to perspire, in conjunction with other parts of the body, the effects of the preliminary cleansing process is more than neutralised by what the skin is liable to excrete from the sweat glands, sebaceous glands, hair follicles, and other minute spaces in the cutis. It was owing to considerations of this kind that led me to adopt a plan by which any organisms thus embedded in the deeper cutaneous structures might be removed before operation. And here let me say that the use of rubber-gloves, so warmly advocated by some, does to a considerable extent mitigate, if it does not entirely remove, the possibility of this later infection. In abdominal work, however, the necessary loss of tactile sensibility involved in enclosing the fingers in materials of any kind is so grave a disadvantage in the delicate manipulations often requisite, that it far exceeds, in my opinion, any good that may be expected from their use as preservatives against hand infection.

The method I wish to describe, and which I have now for some years practised, is founded on the physiological basis of exciting active circulation and active secretion and absorption in the skin prior to operating. I will quote from a paper I wrote upon the subject in the "Annals of

Surgery," to which I shall have cause to refer again
later : *

" There are two ways by which secretion of the
glands of the hand may be excited : one, *naturally*,
by active general exercise coupled with enclosing
the hands in rubber- or kid-gloves; and the other,
artificially, by prolonged immersion of the hands in
hot water. The only practical method is, of course,
the latter. The hands are submerged for, from five
to ten minutes, in water as hot as can be comfortably
borne. The effect of this is to dilate all the capil-
lary vessels, as indicated by the redness of the
skin, and thus excite into active secretion the two
sets of glands. The soddened surface epithelium,
together with the secretions, are finally removed
by first massaging the hands under water by making
one rub the other, and then using some ordinary
soap. Lastly, the hands are rinsed in warm carbolic
lotion (1 in 40), which process is also continued
throughout the operation.

" It will thus be seen, that much more importance
is attached to the physiological side of the question,
than to the mechanical and the chemical. I am
in the habit of tersely expressing my practice by
saying to assistants, that ' soaking is better than
soaping.' It does away with the fallacious notion
that any special kind of antiseptic soap is the
chief agent in sterilising the hands, or that it is
merely the dipping of the hands into an antiseptic
solution that is the principal requisite. The latter,
of importance in themselves, are still only to be
considered as necessary subordinates to the pro-
longed soaking and massaging in hot water."

* 1902, vol. xxxv. p. 1.

I have practically little to add to this, which was written three years ago. The soap I prefer is the ordinary soft-potash soap—" soft-soap " ; and in addition to massaging the hands, an ordinary nail-scrubbing brush is used. On opening the abdomen, the 1 to 40 carbolic solution for rinsing the hands is changed for one of hot normal saline solution (a teaspoonful of sterilised salt to a pint of boiled but cooled water), and throughout the operation the hands are constantly dipped in this.

One great advantage of this method is, besides its practically perfect security against hand infection, the simplicity with which it can be carried out ; so that any practitioner when called upon to operate can do so with at least the sense of one source of security, that whatever else he may lack in the means he may require he is safe against carrying infection by his hands.

(2) The **Sterilisation** of the **Patient's Skin.**— Second only in importance to the condition of the skin of the operator's hands is that of the skin of his patient. And if I may venture to say so, I think we have sometimes lost sight of the remote effects of our abdominal incisions in the gratifying success which has attended our immediate efforts. It is very pleasing to remove an appendix from a patient who is chronically invalided and restore him to good health, but it is anything but pleasing for him to return to us in a year or two with a troublesome ventral hernia. It is the one reflection against exploratory abdominal work, the possibility that we may leave a weakened cicatrix, which by subsequently stretching leads to hernia. I believe I shall reflect the opinion of most men

of any experience in abdominal work when I say that hernia rarely follows wounds that have healed by primary union, and where the patient has been allowed ample time, by rest in the recumbent position, to obtain a well-organised cicatrix. The two causes which have always seemed to me to prove invariably the forerunners of a subsequent hernia are so-called " stitch abscesses," and too short a period of rest after operation. I shall dismiss the second of these two causes by merely stating that my own practice is to retain the patient in the recumbent position for four weeks. Modifications of this period are determined by the age and health of the patient, and by the way the wound has healed. Sometimes, under the most favourable conditions, a little over three weeks suffices; but when such conditions do not exist it may be necessary to extend the period to six weeks.

Now as to " stitch abscess," by which is to be understood any cause that leads to the wound suppurating. Sometimes it has nothing to do with the stitches, but is infection brought about from preventable external causes or unpreventable internal ones. By these latter I mean the infection of the wound-surfaces by septic discharges coming from within the abdomen, as in cases of perforative peritonitis, pyosalpinx, pelvic cellulitis, &c. ; with these causes, however, I do not intend to specially deal in this connection. They have nothing to do with the preparation of the patient's skin, and must be dealt with by other means. What I wish to consider is the cause of sepsis in a wound, when arising from a source in the tissues themselves.

The particular point at issue will be at once grasped when it is clearly understood that micro-organisms exist not only on the surface of the skin, but *deep in the cutaneous and subcutaneous tissues ;* and the importance of the subject becomes still more clear and convincing when it is stated that, prepare the skin as carefully as we may by watery solutions, it will still be found to contain microbes. It would carry me beyond the limits I wish to go to substantiate the truth of this last statement. I must refer the reader to my paper on "Stitch Abscesses and their Prevention" above alluded to. In this paper I have freely quoted Mr. C. B. Lockwood's * work, where as the result of numerous experiments he unmistakably showed that by no known method of preparing the skin was it possible to sterilise it in its deeper parts. Thus, then, we are confronted with the fact that in the various wounds made by the surgeon in the course of his operative procedures through the skin and subcutaneous structures, organisms are liberated to find a nidus for growth in the exudate and damaged or devitalised tissues.

Now it may be said that there are two places at which it is possible for micro-organisms to be liberated, and when set free to develop and multiply. These are the edges of the wound, both superficial and deep, and the channels made by the stitches. In the case of the wound-edges, the line of lesion may pass through micro-organism-bearing centres, in which case a free exit is formed on to the exposed surfaces of the wound. If, then, want of accurate co-aptation of the wound-surfaces or -edges should

* *British Medical Journal.* 1892, vol. i. p. 1127.

allow of the collection of blood or serum, which is not removed by drainage, a suitable nidus and culture-medium is at once established for the unlimited development of such microbes as find their resting-place there. It is only the direct contact of living cells that can combat the active growth of these intruders. Cells and fluids that become vitally inactive or dead have no longer any resistant properties, but, on the other hand, they become the very means of accelerating and encouraging growth, and the septic processes directly dependent thereon. It follows, therefore, that if infection and its consequences are to be successfully combated in regard to wound-surfaces without the introduction of any other aids or preventatives, it must be by the accurate co-aptation of the wound-edges ; and, secondly, where that is not possible, by the removal by drainage of all fluids likely to accumulate between the surfaces.

With regard to the second seat of infection, the stitch-channels, it is probable that this forms the most frequent and fruitful source of subsequent septic troubles in most wounds. And while it is possible that in some cases the stitch itself may be the means of conveying direct infection, it is assumed in the present connection that the infection is solely from the tissues in the wound, and this is the way I believe such infection is brought about. The needle as it passes through the tissues may perforate and expose a micro-organism-bearing focus. If silk is the material used for suture, cells and fluids percolate its fibres, and thus removed from all vital influences these media serve as a nidus and as nourishment for the growth and development of

such micro-organisms as gain entrance into the thread. But probably no deleterious effect would follow were it not that a much more fertile and extensive soil is created by the necrosis of tissues in the immediate neighbourhood of the tightened stitch. It is a perfectly familiar experience to observe how, as a suture is tightly tied, the skin in its immediate neighbourhood is whitened ; that is to say, the pressure produced by the tightening stitch drives out all the blood from the capillary vessels. The result of such total depletion is to cause death of the tissues so deprived. Hence, such micro-organisms as have been set free by the needle-puncture, and have perchance taken up their location in the meshes of the silk thread, find in this devitalised tissue the very medium they require to multiply abundantly, and thus rapidly overcome, in their offensive properties all protective barriers set up by the surrounding healthy tissues. Every degree of this process may be observed in a wound, from the faintest pink blush around the point of entrance or exit of the suture, to the formation of a distinct localised abscess. And, further, many a deep-seated abscess owes its origin to a precisely similar cause.

The practical outcome of these considerations is the question : Can anything be done to sterilise the deeper parts of the skin and the subcutaneous tissues ? And in attempting to answer the question, there is a sufficiently well-known fact, which, I think, contains within it that which admits of an affirmative reply. It is possible to salivate a patient by the inunction of the skin of the abdomen with a mercurial ointment, which proves that the agent

applied is carried by natural channels to a comparatively distant region elsewhere. The means of transit is almost certainly by the lymphatics, and so long as the agent is kept in contact with the skin so long will these channels be engaged in transmitting it to other parts.

From these facts it seemed reasonable to infer, that when an operation was performed upon parts whose lymphatics contained such a potent bactericidal agent as mercury, this should not only prove destructive to any micro-organisms with which it might come into direct contact, but its presence should still further render the normal tissue in a state unfit for the multiplication and development of these bodies.

I will not pursue further the various experiments that were conducted to test the truth or otherwise of the supposed value of a method based upon these surmises. They were all fully detailed in the paper already referred to ; I shall now merely describe the method adopted in the preparation of the abdomen for operation.

(a) Cleanse the skin in the usual way : first, by soap and water ; secondly, by turpentine ; and thirdly, by methylated spirit or ether.

(b) Anoint freely and widely with *hydrated lanoline-oleate of mercury* (20 per cent.) and rub in ; besmear a piece of lint with the same and leave on until a second inunction is performed twelve to eighteen hours later. Every case should be treated for forty-eight hours with two periods of " rubbing in " for about ten minutes on each occasion.

(c) On the operating-table, the piece of lint is

removed and the superfluous ointment partially rubbed off with a piece of sterilised gauze. The part is now ready for operation.

If the ointment is left in contact with the skin for more than forty-eight hours it is apt to raise a crop of pseudo-pustules ; and indeed some skins seem to be much more susceptible than others and fail to stand forty-eight hours. I have operated on the skin when covered with these little inflamed pustular-like vesicles, and found no ill results ensue. But they are distinctly irritating and discomforting to the patient.

The method is only employed for hospital cases ; as it is more particularly in this class of patients that the skin is liable to be deeply infected.

I have been so well pleased with the results attained by the use of this method of inunction, that I now employ it to most other regions of the body when desirous of getting the skin and sub-cutaneous structures into an aseptic condition. The principle upon which it is employed should ever be remembered, for it is only on an *intelligent* application of this principle that good results can be expected. And this is the principle—*that every part should be inuncted the lymph from which passes through the lymphatics that traverse the region to be operated upon.*

Ligatures and **Sutures.**—It would be wrong in the highest degree to minimise the importance of using aseptic ligatures and sutures ; yet I cannot help feeling that many a septic wound has been attributed to the stitch when in reality it was due to infection by the operator's hands or the patient's

skin. If we could be certain that the patient's skin, subcutaneous tissues, and blood were free from micro-organisms ; that the operator's hands and those of his assistants were surgically clean ; and everything that came in contact with the operated-upon parts, whether they be instruments, solutions, or absorbent tissues, were aseptic, few wounds, I believe, would become septic from the ligatures and sutures employed.

It would carry me far beyond the limits I have set myself, to discuss the various materials used and the innumerable methods employed in their preparation. Most men of experience like to use their own materials and to prepare them in their own way ; that is to say, they fix upon ligatures and sutures of certain sizes and certain textures which they use to the exclusion of others. It is good that it should be so, because there is the greater likelihood that a man who carefully makes his own selections, will see to it that they are perfectly efficient for all the purposes for which he wishes to employ them.

While, therefore, willing to extend considerable latitude in the choice of material for tying vessels and stitching tissues, and in their method of preparation, there is one restriction in the matter of their employment which experience has taught me to regard as of considerable importance ; and that is, never to embed a suture or ligature which is incapable of absorption by the tissues within a reasonable time. So far as abdominal work is concerned— and it is that with which we have to do—silk is the only material where this mistake is liable to be committed. At one time, owing to my attaching such

paramount importance to the efficient sterilising of the sutures and ligatures, I used silk for everything. What happened was, that although I usually got the most perfect primary union, and dismissed my patient with a perfectly sound wound, in the course of periods varying between a few weeks and a couple of years, some of my cases returned with a small, painful swelling in the line of the cicatrix. When this was opened a knot of silk would present, sometimes embedded in a small bead of pus. Were this the sole result, little importance need to be attached to it; but in nearly every instance where a stitch or ligature works its way to the surface a weakened cicatrix is left, with the almost equally invariable result, that a tendency to a hernial protrusion ensues, with all the consequent inconvenience and discomfort attached to such a condition.

Why this ejection of a stitch or ligature should take place, in some cases so long after a wound appears to have soundly healed, can only be explained on the assumption that nature, as represented by the healthy human tissues, seeks as a normal process to get rid of everything that is foreign to it; and when unable to do so, shuts it off by an enveloping process which we speak of as encystment. With unabsorbable stitches, however, passed through structures constantly moving, this latter process is not possible, and so they *must* be expelled. But there is another possible explanation, and that is, that while free from all organisms when originally employed, a ligature or suture may subsequently become infected by organisms which may reach the part from the blood; once so

rendered septic, there seems nothing for it but that they must work their way out.

Whatever may be the explanation, the practical teaching seems to be that silk should not be used for either ligatures or sutures when it is necessary that these should be buried; nor, indeed, should it ever be used even for superficial purposes where infection of its fibres is possible through septic discharges, for once it is impregnated it becomes a constant and continuous source of irritation to the tissues through which it is passed.

I will now give briefly the materials I am in the habit of employing in my own abdominal work, their mode of preparation, and the particular usages to which they are put.

Raw Catgut.—This is rarely used for any other purpose than tying small vessels in the abdominal flaps, or for an approximation of deep, soft tissues. No. 1 size is the best. For private work I use either Hartmann's or the Red Cross catgut. The former is ready for immediate use; the latter, which is dry-sterilised, must be put into 1 in 40 carbolic solution for about fifteen minutes before using. In hospital work, where larger quantities are required, the raw, unprepared gut is obtained. It is put into methylated ether for forty-eight hours, then into 1 in 1000 bichloride of mercury solution for another forty-eight hours, after which it is stored in two parts of juniper oil and 1 part of alcohol. For an operation, it is put into sterilised glycerine and alcohol direct from which it is used.

Sulpho-chromic Gut.—This "green" gut, as it is sometimes called for brevity's sake, is the great

mainstay of all ligature and suture work, and could it be always depended upon might be used almost to the exclusion of all other materials. I have, however, sometimes found that a chromic gut ligature or stitch will work its way out, just like a silk one ; and the cause I believe to be due to over-chromicising the gut, whereby it practically becomes an unabsorbable tissue, and often also irritating. Under these circumstances I believe it better not to use the larger sizes, and those which I have found to answer best are No. ooo, No. o, and No. 2. Number " three nothing " may be used for ligatures and for suturing parts where there is not much tension. Number " one nothing " being stouter and stronger, I use for stomach and bowel surgery ; and also for union of abdominal aponeuroses. I think it the most serviceable of the three. Number " two " is only used in exceptional cases, where great strength is required, as in tying a broad pedicle or in drawing together parts in considerable tension. I believe it is practically safe to use this gut out of a 1 in 40 carbolic solution, after twenty minutes' steeping in a 1 in 20 solution. For greater security, however, it is better to prepare it thus : Steep in ether fore twenty-four hours, pour off and boil in zylol for half an hour. Keep in a solution of Hydrarg. Pot. Iod. and absolute alcohol for three days. Use out of 1 in 40 carbolic solution.

Silk-worm gut, also known as **Salmon gut.**— The red or black is better than the white, as being more easily seen. It is exclusively used for surface stitching. In my own work I employ it for two

purposes. First, for mattress sutures where that known as the " extra coarse " size is used and, secondly, where, from the possible septic nature of the wound, I feel it risky to close the skin-flap with silk. It is prepared by putting the gut into cold water, and bringing up to the boil for ten minutes. This is poured off and fresh water added, the same process repeated, and boiled for twenty minutes. It is kept in 1 in 40 carbolic solution, which is changed occasionally.

Silk.—That known as patent ligature silk, made by Archibald Turner and Co., is the kind used. There are many sizes, but Nos. 2 and 4 will, I think, be usually found sufficient. With the exceptions just given above, I close all skin-edges with a continuous silk suture, generally No. 2 size, taking a good grip of the subcutaneous tissues. For preparation, the silk is rolled on glass slides or glass reels and boiled in 1 in 60 carbolic solution for half an hour. It is then kept for use in 1 in 40 carbolic solution.

CHAPTER XVII

ABDOMINAL INCISIONS AND ABDOMINAL SUTURING.

UNTIL comparatively recently, few surgeons would have ventured to depart from the established practice of opening the abdomen in the median line. It had come to be regarded as the line of safety, the line in which there would be no bleeding. Certain digressions there were in particular cases, as in Langenbuch's incision for excision of a large kidney—a vertical incision along the linea semi-lunaris—and in Fenger's oblique incision for gastrostomy. Since these earlier deviations others have crept in, such as the oblique sub-intercostal incision for removal of gall-stones, the curvilinear iliac incision for appendicectomy and oophorectomy. But for purely exploratory purposes and for the treatment of many intra-abominal conditions, the median incision, either above or below the umbilicus, still holds the position of being the one most frequently practised.

It was in 1901 that my thoughts were first directed to the possible advantages of transverse incisions through the abdominal parietes. And it came about in this way. When forced to add a transverse incision to a vertical one, in order to obtain the necessary exposure and room for deeper work, I

noticed that the transverse cut healed quicker, and
when healed was firmer than the median vertical
one.   Indeed, in one case where I had performed
gastrorrhaphy for an atonically dilated stomach,
the patient subsequently developed a median ventral
hernia, while the right transverse cut I had made,
in order to better expose and explore the pylorus,
had formed a firm non-giving cicatrix.   I then
tried an incision—which I shall presently more
fully refer to—which involved a partial division
of the right rectus and a considerable division of
the left in order to expose the body of the
stomach and pyloric region.   This healed up so
well and firmly that I was satisfied there was
something more in these transverse cuts than one
had been led to suppose.   It is true they involved
considerably more bleeding from the divided parts,
but this in itself, the more one began to think about
it, seemed likely to contain one explanation at least
for the better and firmer healing of the wound.
So I was led on to try more and more of these
transverse incisions, until I finally divided the
parietes practically right across in attempting to
remove a large intra-mural uterine fibroid.   The
cicatrix which formed proved a perfect one.   The
illustration, taken from a photograph (Fig. 12),
shows the patient four months after the operation
with an absolutely firm and non-giving cicatrix.

It was in no sense with the object of introducing
a novelty into the mode of opening the abdomen,
nor with any particular desire to depart from the
customary practice of past years, that led me
to try these particular incisions.   Their seeming

advantages were forced upon me by what I saw : as results which occurred in my own practice. When, therefore, they began to appeal to me as something better than I had hitherto experienced, the reasons for the apparent improvement seemed to grow clearer the more one sought for them.

The two primary, or I might add three, causes
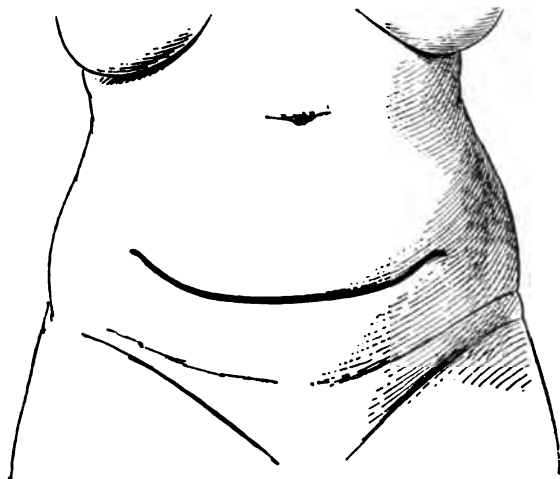
FIG. 12.—Shows extensive curvilinear incision for the removal of a large fibroid of the uterus. (The drawing is taken from a photograph by Dr. John Anderson, of the Victoria Infirmary, Glasgow.)

which appeared to offer themselves as reasonable explanations, why a transverse incision might, or indeed should, form a firmer cicatrix than a median vertical one were, the blood-supply, the lymphatic-supply, and the disposition of the aponeuroses.

It stands to physiological reason, that where there is plenty of blood and lymphatics, the new tissue which forms must be more highly organised, and more capable of fulfilling such functions as may normally belong to it. Now in a median incision

there are practically neither blood-vessels nor lymph-channels, for there is very little in the way of anastomotic communication across the middle line, hence there can be little or no absorption of exuded fluids or damaged tissues, and very imperfect organisation of the newly developed structures. The very opposite anatomical conditions exist in the case of a transverse cut, for here there are numerous blood-vessels, and plenty of lymphatics to remove material the presence of which might otherwise impede repair.

Then as regards the aponeuroses : what constitute the differences between a vertical and a transverse cut so far as these are concerned in the abdominal parietes ? Before answering this question, let me first point out what is the true anatomical disposition of the muscles forming the anterior abdominal wall. The rectus muscle is fixed to the ribs above and the pubes below, but its intervening part is broken up by the lineæ transversæ, so that while the muscle may be divided completely across at one point it is not absolutely paralysed, because of its intermediate attachments to these fibrous septa which prevent any very material separation of the severed muscular fibres. And still further, the union which takes place between the divided muscle-margins is simply a fibrous one, which as it forms and contracts constitutes, so to speak, an adventitious linea transversa. The mere division of this muscle, therefore, I am inclined to think, need have no necessarily weakening effect upon the normal support derived from the anterior abdominal parietes.

As to the great oblique and transverse muscles,

arising as they mostly do from the bony framework of the trunk, there are reasons for believing that they form the most important part in giving the necessary support. Passing forwards and inwards from their attachments laterally, they end on each side in a strong fibrous aponeurosis, which divides to enclose the rectus before uniting in the middle line. Considering this large broad tendon in the light of a strong muscle attachment, the worst possible thing to do to weaken its function would be to divide it across the main direction of its fibres ; and the tension which must always be exercised upon this tendon would necessarily inhibit the proper co-aptation of its margins when severed. Yet, I venture to think, this is exactly what we do when we make a vertical incision whether in the mid-line or to the right or left of it.   There is this, however, to be added in extenuation of the practice.   When the abdomen has to be opened for some condition which has hyperdistended it, and the cause of the hyperdistension has been removed, the division of the aponeurosis no longer necessarily involves any weakening of the muscles, nor does it entail any tension on the stitches used to re-unite the severed edges ; and experience has taught that many a sound and non-giving cicatrix follows in cases of this kind.   But in the hundred and one conditions for which we now open the abdomen, where no such relaxation is obtained, there is bound to be considerable tension, and it is often impossible to get approximation of the aponeurotic edges, without tying so tightly, that the ligature must inevitably cut its way through sooner or later,

leaving thereby a gap to be closed by imperfectly organised cicatricial tissue.

But consider the effect of a transverse cut. Here the division of the aponeurosis is much the same as if one were to make a longitudinal incision through any long tendon ; the edges do not gape from any contraction of the muscle ; and when united come together without tension. This I believe to be the great secret of success which follows the employment of the transverse incision, that we can get our aponeurotic edges together without tension ; and given good blood-supply and plenty of lymphatics we have all the conditions requisite for the best possible process of healing.

These are the reasons, then, which have led me to practise now so frequently, and almost to the exclusion of all others, transverse, curvilinear, and oblique incisions for opening the abdomen. That others had been working on the same lines was unknown to me, until recently revealed in an excellent article on the subject by Dr. Lewis A. Stimson,* of New York. In this paper the author refers to various continental operators who have used the transverse incision. In most, however, it seems that while the skin and aponeurotic incisions have been transverse or curvilinear, the deeper have been vertical. As will be gathered from what I have said above, I have not hesitated to divide the rectus muscles freely when in the least degree needful ; doing so in the full belief that I in no way weakened the abdominal parietes. That division of this muscle is often not necessary

* "Annals of Surgery," August 1904.

can be easily understood, for but little force is required to widely separate its fibres. The question of " cosmetics " is referred to by Stimson, but can hardly be considered worthy of more than passing notice. Far more important is the question of space; and I think there can be little doubt that more room is afforded by this mode of opening the peritoneal cavity than by the vertical incision. This will become clearer as I briefly describe the incisions adopted for dealing with various intra - abdominal disorders.

Abdominal Incisions.

Incision for Gastric Disorders.—The one I now universally employ is an oblique incision which starts from a point about two inches below the ensiform cartilage and an inch to the right of the middle line, downwards and outwards to the left for about four inches, and

FIG. 13.—Diagram of abdominal incisions for visceral operations.

a. For stomach.   *b.* For gall-bladder. *c.* For exploratory purposes.   *d.* For hysteropexy. *e.* For hysterectomy. *f.* For appendix, cæcum, Fallopian tube, and ovary. *g.* For sigmoid flexure, Fallopian tube, and ovary.

about at an inch from the costal margin (*see* Fig. 13, *a*). In deepening this incision into the peritoneal cavity, the inner fibres of the right rectus are divided, and about two inches of the left rectus, embracing in each case the anterior and posterior layers of the rectal sheath. There is

sometimes fairly free bleeding from the divided muscle-edges, and all vessels should be carefully searched for and tied, in order to avoid a subsequent outflow into the space necessarily left by the retracted muscle fibres. This incision admits of a free examination of the pyloric region and of the body of the stomach ; and if gastrectomy, either partial or complete, is necessary, this incision admits as free an access to the parts as could be wished. I have employed it now for something like thirty cases of gastro-jejunostomy, and in not a single instance have I seen a weak cicatrix result.

Incision for Gall-stones.—This incision is practically the same as that employed by many surgeons, who believe that better access is obtained to the common ducts than by the vertical incision to the right of the middle line, suggested and practised by Mr. Mayo Robson. It commences at the same point as that given above for the gastric incision (*see* Fig. 13, *b*), and courses downward and outwards to the right for about five inches, at a distance of about one inch from the intercostal margin. It involves frequently a fairly wide division of the outer fibres of the right rectus muscle ; but the cicatrix which results is always a secure and firm one.

Exploratory Incision.—It not infrequently happens that the surgeon is called upon to open the abdomen in cases where no certain diagnosis can be formed beforehand. There are many possibilities as to the cause, and the problem to be solved is, with what organ within the abdomen is the mischief associated. It is no easy matter

to examine the whole of the small and large
intestine, the pelvic viscera, the stomach, the
gall-bladder, and the other contents of the cavity
through one incision ; and still more difficult
to accomplish what may be deemed necessary
through the same opening. The incision which I
think approaches nearest to supplying these re-
quirements, is a curvilinear one of about three
inches in extent carried across the abdomen about
an inch below the umbilicus (*see* Fig. 13, *c*). For
merely exploratory purposes there may be no need
to divide the rectus muscle fibres, the anterior
and posterior layers of the sheath being alone
severed, for the muscle can be easily pushed or
drawn aside. The practical utility of this incision
will be best appreciated by the narration of a
couple of cases. The first was that of a woman
aged fifty-five years, who had for long suffered
from attacks of pain across the front of her
abdomen. There was nothing else to be made
out of her case : nothing whatever to localise
the cause of her pain. Her doctor, who sent her
to me, thought that her pain must be due to
temporary attacks of obstruction in the large
bowel. She lay in my ward for a few days, but
during that period had no symptoms. Her doctor,
a particularly shrewd and capable practitioner,
was anxious something should be done ; and,
knowing the worth of his opinion, I did not hesitate
to explore the abdomen. This I did through
the incision above described. The small intestines
were withdrawn, the large intestine traced through-
out its course, the appendix exposed, and the

pelvic viscera examined, but all with a negative result. The small intestines were then replaced and the stomach drawn down, but nothing noted ; when, however, the fingers were carried up into the gall-bladder region, gall-stones were felt packing the bladder, with an unduly large one impacted in the cystic duct. All that was then done was to extend upwards the right limb of the exploratory incision until the parts were sufficiently exposed to enable them to be efficiently dealt with. The gall-bladder was tightly packed with stones, and after their removal it was with some difficulty that the stone impacted in the cystic duct was dislodged. It was the size of a pigeon's egg, and adherent to the walls of the duct. The operation was completed in the usual way with drainage-tubes and packing, as the gall-bladder could not be brought forward sufficiently to be stitched to the parietal wound. The patient made an excellent recovery, and was relieved of her abdominal pains. It is interesting to note that this patient never suffered from typical biliary colic, and indeed, beyond the " referred " umbilical pain, had never a single symptom suggestive of gall-stones.

The second case was almost as equally interesting. A girl aged twelve years was sent into my ward supposed to be suffering from acute intussusception. We were told she had passed blood and mucus, but otherwise neither flatus nor normal motions had come away for four days. The girl looked extremely ill, with sunken eyes, furred tongue, and a painless distended abdomen. Vomiting had been occasional, but was said not

to be " bad smelling." She was much emaciated, but suffering no pain ; looking indeed rather toxic. I was not satisfied as to what was the cause of her illness, and decided to adopt the curvilinear sub-umbilical incision for a preliminary exploration. Immediately on opening the abdominal cavity, livid distended coils of small intestine presented ; these were withdrawn when something was felt to give way and out came a collapsed coil from the right iliac fossa, marked off by a well-defined constricted line between the distended and collapsed portions of the bowel. It was then discovered that a slender band formed by omentum extended down towards the right brim of the pelvis. In order, therefore, to expose what clearly now was known to be the seat of the mischief, the right limb of the exploratory incision was carried downwards and outwards. By this exposure, it was at once seen that the mischief arose from an appendicitis, which had bound down the margin of the omentum, causing it to form a tight band beneath which the small intestine had been strangulated. A small abscess also existed around the apex of the appendix. Appendicectomy was performed ; the omentum which was adherent removed, and the distended coils of small intestine tapped in order to squeeze out the toxic liquid contents. The patient made an excellent recovery. Had a median incision been employed in this case, a second incision would have been necessary in the right inguinal region, and much time thereby added to the duration of the operation, which otherwise lasted only about thirty-five minutes.

Inguinal or Iliac Incisions.—Little need be said
regarding these. For appendicæcal mischief, the
right incision is the one universally adopted (*see*
Fig. 13, *f*). The same incision carried a little more
inwards is the best for the removal of the appen-
dages. The same incision on the left side (Fig.
13, *g*) answers a similar purpose. When it is neces-
sary. to explore both ovarian regions, in order to
determine whether operation is needed on one or
other side, a small curvilinear incision in the middle
line about an inch or so above the pubes is best
(central part of *e*, Fig. 13).

Superpubic Incisions.—A small transverse in-
cision about two inches above the pubes is a good
one for hysteropexy. There is usually no need
to divide the fibres of the rectus muscle, retraction
affords sufficient room for securing the uterus
and stitching it to the parietes (*see* Fig. 13, *d*). A
curvilinear incision about an inch or so above
the pubes and extended on either side to the
required extent affords an excellent exposure of
the uterus ; and in the case of pan-hysterectomy
or myectomy, allows of the easiest possible access
to the uterine vessels. I have little doubt that this
incision facilitates greatly the speed with which
large tumours of the uterus can be removed, and
I think lessens very materially the chances of
hæmorrhage. I have already referred to a case
where a huge fibroid was removed rapidly and
with ease and perfect security by an incision which
had to be extended for about ten inches (*see* Fig.
12, p. 229), the resulting cicatrix being all that
could be desired.

Incision for the Radical Cure of so-called Umbilical Hernia in the Adult.—The care of this form of hernia, often really ventral and not strictly umbilical, is difficult, and many methods have been devised. Occurring, as it mostly does, in very stout women, there is usually some laxity of the abdominal aponeuroses, and hence whether a vertical or a transverse incision is made through the rectus sheath, is sometimes not of much moment. I am, however, inclined to believe that the aperture in the aponeurosis is better closed transversely than vertically : that there is less tension and liability to stretching of the newly formed cicatrix. For this reason my plan is now, after excising the redundant and loculated sac, to clean the edges of the aponeurotic orifice transversely, and if the fibrous structures admit of so doing drawing down and fixing the upper margin for a quarter or half of an inch *over* the lower. The transverse incision through the skin and thick subcutaneous fat often extends to several inches, but this is closed by the method of mattress suturing to be presently described, and rarely fails to heal by primary union. A detail in the performance of this operation I may briefly mention here, although it is somewhat foreign to the particular points under discussion. The herniated structures are usually the great omentum and the transverse colon. It is generally necessary to remove more or less of the former ; but if a sufficient amount remains I have now in several cases fixed the omentum by a stitch to the under-surface of the parietes in the left iliac region. This is done

by first securing the omentum with a strand of silk-worm gut; the two free ends of this are threaded in a long-handled needle, and by means of the left index-finger within the abdomen the needle is guided down to the left iliac region, where it is made to puncture the parietes, and convey the two extremities of the stitch to the outside of the abdomen. The ends are slipped free from the needle and the latter withdrawn. By pulling on these two ends, the omentum is dragged down to the required position, and in thus displacing both the colon and the omentum from opposite the site of the hernia, the tendency of a re-protrusion is prevented. The ends of the stitch are fixed over a zinc "button," and at the end of ten days or a fortnight, the whole stitch is withdrawn.

Other Incisions. — It must always be understood that an incision is of secondary importance compared to the efficient treatment of the condition for which it is employed; so that it may often happen, that no stereotyped line can be followed, but that cross-cuts, extensions, second openings, and other deviations must be employed, to enable the necessary treatment to be adopted. It is better to err on the side of a too free approach, than to run any risks in the way of incompleteness in deep abdominal work. The worst that can happen in the former case is a weakened cicatrix; but any failure, no matter how small in the latter, may endanger life. Owing to the few blood-vessels met with in the middle line, the abdomen can be more rapidly opened by median incisions; and where, from the patient's condition, speed in

operating is of importance, this method should be
selected.

Abdominal Suturing.

Of equal importance to the method of opening
the abdomen is the process of closing it. The
matter is one of obtaining a perfectly sound and
non-giving cicatrix. And if one attempted to
lay down tersely any golden rule as to the practice
to be pursued, it would be *the obtaining of accurate
co-aptation without tension by means of absorbable
sutures*.

Most surgeons agree that the best cicatrix is
obtained by " serial sutures "—that is to say,
by the union of severed margins of like structures
—peritoneum with peritoneum, aponeurosis with
aponeurosis, subcutaneous tissues with subcutaneous
tissues, dermis with dermis, and epidermis with
epidermis. If such a union is brought about by
" first intention," it practically amounts to the
perfect reproduction of conditions as they were.
The one tissue, however, which does not admit
of accurate co-aptation when divided is muscle ;
but it is probable that the subsequent develop-
ment of fibrous tissue which takes place in the
space between the primarily retracted margins,
quite sufficiently compensates, in the matter of
resisting power, for the loss of muscle sustained.

I should not have thought it worth while re-
ferring at any length to the matter of abdominal
suture, were it not that I have been led to adopt
a particular method of co-apting the subcutaneous
tissues in unduly fat patients, which has afforded

most gratifying results. But first, let me briefly say, as regards the deeper structures, that I now exclusively use sulpho-chromic gut of the sizes and mode of preparation above given (*see* p. 224). The peritoneal edges are brought together by a continuous suture of number " three nothing " gut (No. ooo). When, as sometimes happens in the case of the posterior rectus sheath, this has to be approximated by the same stitch as that which includes the peritoneum—for it is wise under the circumstances not to separate the two structures one from the other—a stouter gut should be used (No. o), the sutures not being continuous but passed as an interrupted series. The reason being that should one strand by any chance give, the others would still hold secure ; whereas in a continuous suture the giving of one loop might relax the whole stitch.

The union of the aponeurotic edges is effected by a series of "interrupted " sutures placed sufficiently close together so as to leave no gaping intervals. The size of sulpho-chromic gut used is number " nothing " (No. o). In all cases where the rectus is divided in its upper three-fourths— this is to say, where the sheath is double—both anterior and posterior layers should be united by a separate series of sutures. And here let me add that in applying the sutures to the anterior layer of the sheath, the retracted margins of the divided muscles should be seized and drawn sufficiently into the gap to admit of a few fibres being caught in these sutures, which should also, here and there, catch up and transfix the united margin of the posterior sheath. I attach no little importance

to this detail in the application of this series of sutures, for this reason : that by catching hold of a few muscular fibres and the posterior layer of the sheath the space which otherwise would be left between the retracted edges of the rectus muscle is, for the time being, to some extent obliterated.   What I have found where this has not been done is, that this space slowly fills with exuded blood and serum, which has generally in the course of a week or so to be let out.   I do not think it has ever subsequently resulted in a weakened cicatrix, but it was a not unfrequent occurrence in some of my earlier oblique " stomach " incisions. It is not to be understood that the transfixion of the muscle fibres is of any ultimate service, it is only that by holding these for a few hours the capillary blood-vessels have time to become sealed, and no free space exists for the accumulation of exudates.   The last process of suturing consists in uniting the edges of the skin and subcutaneous tissue : a simple enough one when the raw margins of the flaps do not exceed about a quarter of an inch in thickness.   In all aseptic incisions, or rather in all wounds where it is considered that the edges of the skin-flaps are aseptic, a continuous silk-suture is used—No. 2 size, prepared as above (*see* p. 226).   When, however, the margin of the skin-flaps exceeds a quarter of an inch or so in thickness, mattress sutures are employed ; and it is to the method of using these that I have come to attach considerable importance.   What I believe usually happens when an attempt is made to unite thick fat wound-edges by a single series of interrupted sutures or by a continuous one is, that a space

is left between the subcutaneous tissue and the
aponeurotic layer ; a space that soon fills with
liquid-fat and with blood exudates. If by any
chance septic micro-organisms find their way either
from the blood or the tissues into this pent-up
collection of devitalised fluids, an inflammatory
process is started, and more or less suddenly after
a week's apparent perfect progress the temperature
rises, the wound looks a little swollen, and very
soon there is evidence of suppuration deep in the
line of the incision. This has often been attributed
to, and described as, "stitch abscesses." The real
fault, however, lies not with the stitches but with
the mode of stitching. And the consequences of
this " little stitch abscess mischief," as it is often
too lightly regarded, are that a weakened cicatrix
will almost with certainty result, ending later in
a troublesome ventral hernia.

The evil is sufficiently well recognised by most
men of experience, and the usual way of preventing
it has been to introduce drainage-tubes, to ensure
the removal of any liquid-fat and other exuded
products. Until I adopted the method I am now
going to describe, I drained in this way. But, as is
well known, wherever a drainage-tube is used
there cannot be primary union of a wound, and
whenever there is not primary union, an absolutely
secure and non-giving cicatrix cannot be guaranteed.

Mattress stitches are well known, and there are
many ways of inserting them. For that reason I
shall not venture to predict that the following
method is a new one. I have not seen it described
elsewhere, and I have now employed it, to my

entire satisfaction for over two years. The stoutest
silk-worm gut is required, and for the purpose I
have a selected series of strands known in the
market as " extra coarse." One strand is threaded
in a large, curved bayonet-edged needle. The
needle is entered at an inch or more from the
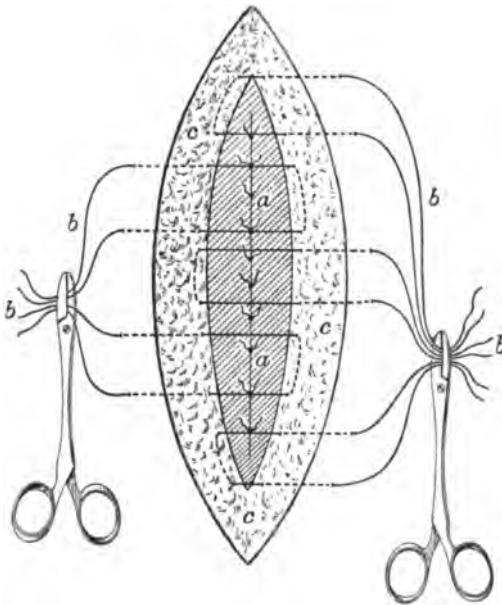
FIG. 14.—Shows method of passing mattress sutures prior to closing the skin edges.

a. Series of interrupted aponeurotic sutures. b. Series of mattress sutures clamped ready
for tying after suturing the skin edges. c. Raw edges of skin-flaps.

margin of the wound, made to penetrate the sub-
cutaneous fat, and emerge in the floor of the
wound near the aponeurosis (see Fig. 14). It
traverses the " floor " entering the opposite sub-
cutaneous tissue on a level with that from which
it emerged. It is then made to embrace a good
bit of this deep subcutaneous tissue by a semi-

circular circuit of the needle. The needle emerges
on the same plane, re-traverses the floor, re-enters
the subcutaneous tissues, and makes its exit from
the skin about one inch from the original point of
entrance at the same distance from the skin-
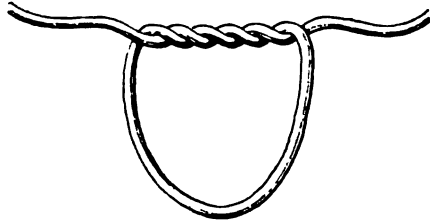
FIG. 15.—First stage in tying mattress suture.

margin. The two ends of this ligature are held
by a pair of " catch-forceps." Others are then
passed in the same way, until a sufficient number
have been employed, to ensure, when tied, a
complete co-aptation of the subcutaneous tissues,
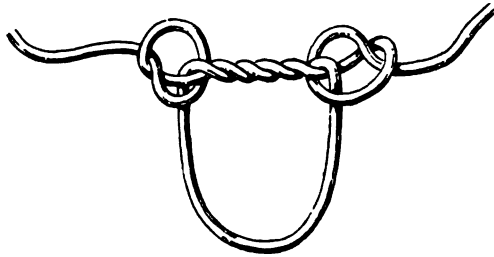
FIG. 16.—Second stage in tying mattress suture.

more particularly in their deeper parts. These
sutures are now laid aside, while the skin-edges
are brought together by a continuous silk suture,
to be taken up again, however, so soon as this
latter is completed. The proper tying of these
mattress sutures will not at first be found easy,

although after a little practice all difficulty dis-
appears. The description of the method will be
better understood by a reference to the illustra-
tions (Figs. 15, 16, and 17). After rendering
taut the two free ends, by which traction the
deep subcutaneous structures are approximated,
they are twisted round each other three times.
This twisted knot when drawn taut rests flush
on the skin-surface, and by means of a pair of
dissecting-forceps inserted between the skin and
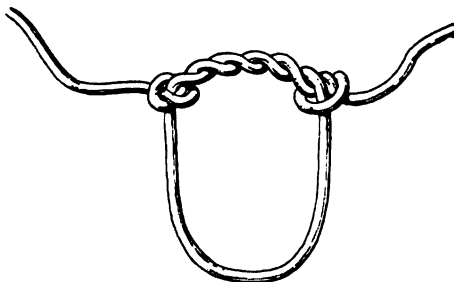
FIG. 17.—Completed stage in tying mattress suture.   Shows looping of the
suture between the two knots.

the twisted suture, one free end is laid hold of,
drawn under, and tied into a simple knot at the
extremity of the twist (*see* Fig. 16). It is im-
portant in tightening up this simple knot to pull
well on the other extremity, in order that when
tied it is placed as far as possible to one side. The
same process is repeated at the other end of the
twist ; again good tension must be made by pulling
on the end already tied, for the same reason that
the second simple knot may lie as far as possible
to its side. Immediately on relaxing, if the knots
have been properly tied, the " twist " between

them will be seen to spring up in an arch from the skin (Fig. 17). And herein will at once appear the advantage of this method of tying, for the skin and subcutaneous tissues lying between the twist and the margins of the wound are perfectly free from all pressure ; in other words, there is not the least interference with the proper blood-supply to the wound, and hence nothing to impede perfect repair. Fig. 18 diagrammatically represents the appearance of a wound after all suturing is complete (except that the ends of the silk stitch have been left to show how the last knot is tied); the archings of the mattress sutures are shown on each side. In the course of three or four days the " simple knots " of the mattress sutures tend to ulcerate into the skin, but by that time the suture has practi-
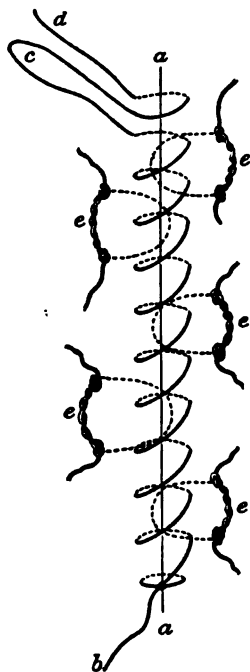
Fig. 18.—Shows closure of wound completed.

a, a. Line of skin incision. *b.* Continuous silk suture. *c.* Loop left long to tie with end *d* for finishing knot. *e, e.* Shows arching of mattress suture after tying both ends.

cally accomplished its work, and it is my custom to remove them on either the fourth or fifth day. This is done by pulling tightly on one end until it is possible to snip through the suture on the skin-side of the " simple knot "; the whole is then easily withdrawn.

There is one class of wounds where nothing that has been previously said can be considered applicable. I allude to wounds that have been necessarily soiled by the exit of deep-seated septic material ; and where also it is necessary to obtain free drainage by stuffing or tubes. In these I believe it safer to transfix all the tissues forming the wound-edges, from the peritoneum deeply to the skin on the surface, by a series of interrupted silkworm gut stitches. There is no fear of these becoming impregnated with septic material, and they are capable of being completely withdrawn.

Another class of wounds merits special treatment and those are abdominal incisions in young children. Time in operating is often a consideration, and the more quickly the wound is closed, after the necessary intra-abdominal work is completed, the better. For these, therefore, the through-and-through silkworm gut suture is best, used as a series of interrupted stitches. And it is noteworthy in children that by this method of suture a perfectly sound and non-giving cicatrix invariably results.

CHAPTER XVIII

PRACTICAL HINTS IN THE PERFORMANCE OF CERTAIN SPECIAL ABDOMINAL OPERATIONS.

THERE are a few points which I have come to regard as of considerable importance in the performance of certain operations within the abdomen. There may be nothing new in many of them, but their neglect has in some instances caused me to reap failure, while their observance has in most instances certainly led me to success. I own to laying myself open to the possible imputation, that I may be neglecting to emphasise the importance of other points of detail which, to some, may seem more worthy of regard than those to which I am about to refer. It is only too likely that each man alone is conscious of his own particular weak points—at least, he should ever seek to be so; and that where one would pursue a certain practice as the mere dictates of common sense, another would regard the same procedure as a prominent factor in his scheme of treatment. No work calls for more presence of mind or for the exercise of more common sense than does the proper treatment of many intra-abdominal lesions; for the very reason that in the majority of cases— and I use the word advisedly—the nature of the lesion is unknown before operation, and has,

therefore, to be dealt with without forethought as to what may be actually required, but by resources that must be drawn upon on the " spur of the moment." I do not intend to deal with any disputed points, such, for instances, as to whether the abdomen should be flushed or dry-swabbed in certain conditions, drained or not drained in others. I always feel that where success follows both alternatives, whatever they may be, there must be something to be said in favour of both. The determining factor of success is probably to be found much more frequently in the capability of the operator than in the particular method employed. And if a rule had to be laid down, it should be that knowing the various courses that may be adopted, the proper procedure is to select that which the particular nature of the case seems most to demand. With these few preliminary and general remarks, I shall now briefly allude to the points that have personally appealed to me in my own practice when performing certain operations.

Injuries to the Visceral Peritoneum.—Of the many functions which the peritoneum subserves, not the least is the protective property it possesses over the parts which it envelops or covers. And in none possibly is this function of greater importance than in the case of the large and small intestines. To injure the peritoneum over these viscera is to allow of a direct lymphatic connection between the contents of the bowel and the general abdominal cavity. In other words, should there be pathogenic organisms in the bowel in the neighbourhood

of a part where the peritoneum has been removed, there is nothing to prevent these organisms finding their way through the intestinal walls into the general cavity. For this reason, therefore, I have never regarded lightly the slightest lesion of the peritoneum as it covers the bowel. There are a few special conditions where in operating this lesion is very liable to occur. In the reduction of an intussusception, it frequently happens, as the swollen and enlarged intussusceptum is being squeezed backwards, that as it approaches the neck and final ensheathing part of the bowel, the peritoneum of the wall of the intussuscipiens bursts open and leaves a gaping superficial surface. Or again, in separating adhesions, the healthy peritoneum is liable to be lacerated close to their points of attachment. I have known this frequently happen in operating upon cases of recurrent appendicitis. Even the simple manipulation and pulling on the cæcum has caused its peritoneal coat to become abraded. The separation of pelvic adhesions is another fruitful source of peritoneal laceration. Recognising, therefore, the ease with which the accident may take place, and the probable pathological importance to be attached to it, it is a simple matter to deal with. If the laceration is small a purse-string suture (*see* Fig. 20, for mode of passing the suture) of No. 000 sulpho-chromic gut can be passed around, and when tied invaginate the lesion. If, on the other hand, it is too large for this procedure, a single continuous Lembert suture of the same material will serve the required purpose.

The Treatment of Distended Coils of Small Intestine in Cases of Acute Obstruction.—It is well known that death from acute intestinal obstruction most frequently occurs from toxæmia, and the only possible source of the poison is the churned up and fermented contents of the bowel above the seat of obstruction. Absorption of the poison doubtlessly takes place from the bowel itself, but it becomes much more potent when taken in from the stomach, as is clearly shown by the marked temporary improvement which follows upon removal, by lavage, of the gastric contents when that has come to be regurgitated material from the intestine.

Recognising, therefore, the value of washing out the stomach, washing out the bowel also would appear to be a matter of equal moment. The usually extreme condition of these patients does not admit of a prolonged operation, and possibly the simple emptying of the intestines answers the purpose. But, I think, there is no doubt that once we have relieved the cause of the obstruction, we have only half accomplished our duty if we do not proceed to empty the bowels of their toxic contents. And this should be done in no half-hearted way. It is best accomplished by placing a distended coil in charge of an assistant (*see* Fig. 19), who grasps it by his two fingers and thumbs in such a way as to leave an interval of about a couple of inches. Thus secured, the part can be easily manipulated and held over a receptacle to receive the contents of the bowel after it has been incised. The operator then proceeds to squeeze

out the contents by slipping coil after coil through his fingers, the assistant meanwhile pinching his segment of the gut distal to the opening, that is to say, he prevents the intestinal contents passing on and ensures its escape through the orifice. By this method I have passed the whole length of the distended gut, amounting in some instances to several feet, through my fingers, and I am disposed
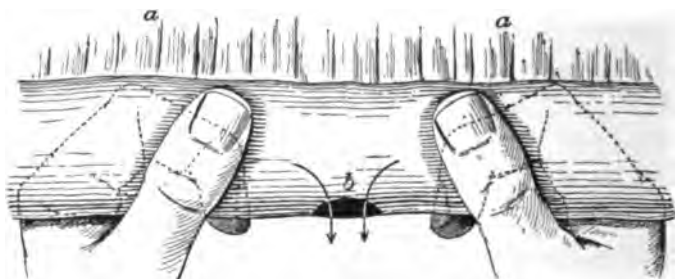
FIG. 19.—Method of holding bowel in removing its contents.

a, a. Mesenteric border. *b.* Orifice of exit. When the left forefinger and thumb are pressed together, material can only escape out of the orifice when coming or being squeezed from the right, and *vice versa.*

to believe that the massaging, which the intestinal parietes practically get, is a good thing. For the walls are usually livid from engorgement, and the gently squeezing and rubbing them through the fingers possibly helps to empty the congested vessels and allow better circulation in the poisoned tissues. In some cases it is better and more rapid to close up the first opening and make another in a second segment. And when it is deemed wise to flush the canal with warm saline solution, two orifices will be needed, one for the injection of the fluid and the other, or lower, for its ejection. For the closure of these intestinal incisions a single con-

tinuous Lembert suture is sufficient. Before re-
turning the now collapsed coils of intestine, they
should be thoroughly flushed with warm saline solu-
tion, so that any contaminating traces of escaped
fæcal material may be washed away. That success
has followed this method of treatment in cases where
the patient has been in an almost moribund condi-
tion at the time of operation, is sufficient testimony
to its advantages.

I know that some will take exception to the with-
drawal of the distended coils from the abdomen,
and equally to the amount of manipulation to
which they are subjected. Perhaps my experience
has not been sufficient to meet with cases where
the one is not necessary and the other can be dis-
pensed with. But in such as I have had I must own
to have felt that I was running less risk in the
withdrawing the intestines until I had met with
the seat and cause of obstruction and dealt with
it in the manner required, than I should have done
had I first digitally groped about in a tightly packed
abdomen to discover the source of the mischief.
And further, I have failed to meet with an advanced
case where simple incision of the gut has been
followed by a sufficient involuntary evacuation
of its contents. As a rule the intestinal parietes
are paralysed both from hyperdistension and toxic
infection, so that the walls are incapable of peri-
stalsis, and by no means can the fœtid and poisonous
contents be got rid of, except by forcibly squeezing
it out. It is a simple matter for an assistant to
keep the exventrated coils warm and well protected
by pieces of dry sterilised lint. The one fact,

however, which has appealed to me as a disadvantage in withdrawing the intestines before the obstruction has been removed or the tension relieved by tapping is, that immediately they are released from the restraining influences of the abdominal parietes, the distension increases and the intestinal parietes become subjected to still greater stretching. The teaching on this point, therefore, is that as little delay as possible should be exercised in tapping the distended coils after their withdrawal from the abdominal cavity.

Treatment of Intestines in Peritonitis.—In acute general peritonitis, from whatever cause arising, the intestines soon become distended. The distension is different, however, in its origin from that met with in acute obstruction. In the latter case, as has already been described, the causes arise from within the bowel, but in acute peritonitis they come from without ; the ultimate effect is to some extent the same in both, the parietes become paralysed and distension of the canal with gas, exudation, and fæcal material ensues. The removal of all septic fluids and other material from the general peritoneal cavity by dry-swabbing or flushing is a sufficiently recognised procedure not to require further notice. But the emptying of the distended coils is not so universally practised, and yet this is important if the already enfeebled muscle tissues are to regain their normal peristaltic power.

It has been long recognised—and I think the late Mr. Lawson Tait, of Birmingham, is responsible for originating the practice—that purgatives are an admirable means of checking the onset of peritonitis,

and often inhibiting its progress when once com-
menced. It stands to reason to some extent, that
if you can produce a free flow from the bowels, you
must deplete the peritoneal vessels, and so check
the tendency to inflammation. It is on these grounds
that I have long advocated the frequent administra-
tion of sulphate of magnesia in drachm doses
every hour, in the earliest stage of an attack of
appendicitis. The watery evacuation which this
particular drug evokes, depletes the vessels in the
cæcal region, and so by preventing congestion and
stagnation of the blood-supply, tends to lessen the
chances of an extensive inflammatory process in
the part.

To administer an aperient by the mouth to a
patient who is already possibly ejecting every-
thing from the stomach is, of course, a useless
procedure. My practice, therefore, has been, after
tapping the bowel, to inject, through the evacuatory
opening, an ounce of sulphate of magnesia. The
salt, dissolved in about a couple of ounces of warm
water, is inserted into a glass syringe, the nozzle
of which is passed into the bowel. Who originated
the idea I do not remember, but I have consistently
carried it out now for some years and believe it
to be an excellent procedure. I drew attention
to the practice in a paper in the *British Medical
Journal** five years ago, and published four cases
in which it was successfully executed, and at the
present time (September 1904) I have a patient
in my wards, who appeared moribund at the time
of operation, from a general suppurative peritonitis

* 1899, vol. i. p. 842.

due to perforation of the appendix, where I success-
fully employed this same procedure. It is always
questionable to attribute success in any one case
or even class of cases to a particular procedure,
especially when its employment is simply one
means out of many that are used. In this
instance, however, it seems so rational that a
free and easy action of the bowels should be
fraught with the best possible issues, that I am
inclined to attribute the good results, in many
of these almost desperate and often apparently
hopeless cases, to this simple and absolutely safe
procedure.

**Treatment of the Stump of the Appendix
after Appendicectomy; and of Appendicæcal
Abscess.**—My remarks have more to do with the
abscess than with the appendix. Most men, I dare
say, have their own special way of amputating the
appendix, and do so with perfect success. But
should there, perchance, be any who have not
tried the following very simple procedure, I can
confidently recommend it as one that can be
executed expeditiously, and in the majority of
cases. Of course, it is not new! When the organ
has been freed from its mesentery, and from any
adventitious attachments which it may have made,
it is held well up by an assistant (*see* Fig. 20).
With a " bowel " needle threaded with No. o
sulpho-chromic gut, a purse-string stitch is passed
through the serous coat of the cæcum a little beyond
the base of attachment of the appendix. This
for the present is left lax. A raw catgut ligature
is tied around the base of the organ, and the latter

cut away with the scissors. The cut edges of the stump are touched with pure carbolic acid and then pressed in with the forceps, while the purse-string stitch is drawn tight. Thus the stump is com-pletely invaginated and covered with peritoneum. The procedure takes almost as short a time to execute as it does to describe.

The one possible objection to this simple and rapid method of removing the appendix is, that after tying the purse - string suture, the ligated stump becomes embedded in a small cavity lined with peritoneum, within which, if the raw stump edge be not aseptic, a collection of material could take place. I believe, how-ever, this danger is re-duced to a minimum by freely touching the mucous membrane with

Fig. 20.—Purse-string invagination of stump of appendix after amputation.

a, a. Free ends of purse-string suture.

pure carbolic acid before embedding, and by using a plain catgut ligature for tying. This latter, becoming rapidly absorbed, allows any exuda-tion or collection to empty itself readily into the cæcum.

There are two kinds of *appendicæcal abscesses* which, I think, deserve separate and distinct con-sideration and treatment. The one is the compara-tively small abscess which forms deeply and rapidly in connection with a perforating or sloughing appen-

dicitis ; the other is that which begins to manifest itself some few days after the initial attack, and is marked by no very acute symptoms, except, it may be, by a distinct tender swelling in the inguinal or lumbar region, and by a certain amount of feverishness.

With regard to the first, the abscess is usually not discovered until exposed in the ordinary process of performing appendicectomy. It may be but very slightly and insecurely shut off from the general peritoneal cavity, and therefore in dealing with its putrid contents, this must be very gently swabbed away with small scraps of gauze, until the cavity is as dry as it is possible to get it. My practice at this stage has been to *freely* swab the lining-wall of the abscess-cavity with pure carbolic acid. A small piece of rolled-up gauze is fixed in an ordinary pair of forci-pressure forceps, this is dipped into a receptacle containing pure liquid carbolic acid, and then gently applied to the whole lining-surface of the septic cavity. This may be repeated as many times as may be deemed sufficient to thoroughly get at any septic focus. The cavity is again dried with gauze " scraps," and then freely dusted with pure iodoform—rarely less than could be piled upon a sixpenny- or shilling-piece. Lastly, the cavity is gently stuffed with iodoform gauze, the end of the plug being brought out at one extremity of the wound. This is removed usually on the third day. I have frequently found in adopting this method, that no matter how putrid and offensive the conditions at the time of operating, the plug on removal has not a taint of fœtor about it. It is well after

removal of the plug to insert a small rubber drainage-tube, so as to ensure the cavity closing from the bottom.

In the second case, that of an abscess which has reached a size so considerable that it causes a visible projection, the question arises : Should it be simply opened by an incision only sufficiently large to admit of a free escape of its contents, or should appendicectomy be performed and the abscess treated in the natural course of this procedure ? I must own to a preference for the former practice, and for this reason. There is probably no immediate danger associated with the presence of the appendix itself ; but if an incision is to be made, in order properly to excise the appendix, it will in all probability have to be a fairly extensive one, so as to run no risk of soiling the general peritoneal cavity by pus from the abscess. But while the peritoneum can be protected from infection, not so the edges of the abdominal incision ; and further, the almost necessary employment of a drainage-tube must leave a portion of the wound unsutured. The case may in a general way do well enough, but the chances are greatly in favour of the wound not healing by primary union, indeed, it is hardly possible for it to do so. The patient may, and probably will, leave our hands with a completely healed wound, but he is likely enough to return to us months afterwards with a very troublesome ventral hernia, or with a tendency in that direction.

If, on the other hand, we simply incise the abscess by as small an opening as is consistent

with free drainage, we give the patient the chance of being perfectly cured by the one operation ; and equally of being freed from the possibility of a hernia should a second operation for the removal of the appendix become subsequently necessary. It is a sufficiently established *pathological* fact, that the appendix sometimes becomes completely destroyed by the inflammatory process which has led to the formation of the abscess, and in the process of repair loses its identity in the general cicatrisation which takes place. And it is also a sufficiently established *clinical* fact, that to remove an appendix when all active inflammation has subsided is to do so through an incision that will heal by primary union, and leave a perfectly firm and non-giving cicatrix.

For these reasons, therefore, I now rarely advise an appendicectomy when it seems likely that a localised abscess can be opened by a small incision. The immediate risks run, if indeed under these circumstances they can be termed risks, are small, in my estimation, compared to the possible future development of a troublesome ventral hernia by a too ready resort to appendicectomy.

Treatment of the Broad Ligament or Meso-metrium in Removal of the Uterus and Appendages.—The two particular points to which I wish to draw attention, refer to the blood-vessels and lymphatics which are contained within the meshes of the broad ligament or meso-metrium.

First, as regards the vessels. The most important are the ovarian, which course along the upper or free border of the broad ligament. These vessels

and their branches vary in size in direct proportion to the quantity of blood needed ; so that in the case of large ovarian cystomata, or other tumours associated with the ovary, Fallopian tube, or broad ligament, they are often of quite large dimensions. To tie off securely the pedicle of a large tumour is sometimes no easy matter ; and while no method of ligaturing is safer than that of a Staffordshire knot, this is rarely applicable to stumps of considerable breadth and thickness. Attempts to employ it under these circumstances may fail in one of two ways. The quantity of tissue enclosed in the knot may be so great that it may fail sufficiently to compress some of the vessels contained in the
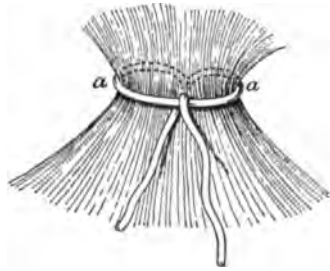
Fig. 21.—Staffordshire knot passed but not tied.

a, a. Show where, in broad stumps, the tissues are liable to slip from within the ligature.

central parts, and although no hæmorrhage may be observed at the time of operation while the blood-pressure is low, it may take place some hours later as reaction sets in. The second source of failure arises from the danger of some of the tissue forming the outer portions of the stump, slipping underneath the lateral edges of the suture (see Fig. 21), by reason of the greater tension which exists at these particular points. Here again the accident may not happen immediately, nor indeed for some little time after the operation is completed and the patient returned to the bed-room. Hæmorrhage, as in the

previous case, may be slow ; but, where perchance the vessels which are free are large, symptoms from loss of blood will rapidly become manifest.

A plan I am now in the habit of using reduces to a minimum, I think, the possible occurrence of these accidents. It will be best understood by a reference to the illustration (*see* Fig. 22). It consists in tying off the ligament or pedicle by three, four, or more interrupted ligatures. These are passed by means of an aneurysm-needle, but the outer or upper one which includes the ovarian vessels is employed somewhat differently. After one
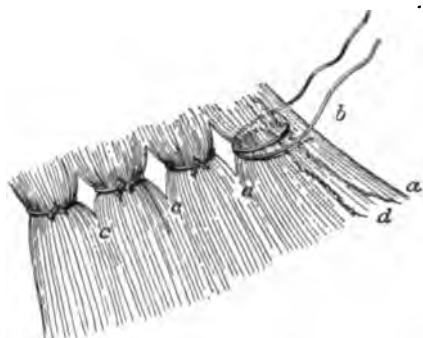
FIG. 22.—Method of tying the broad ligament or meso-metrium in the removal of large uterine or ovarian tumours.

a. Free edge of ovarian ligament. *b.* Point close to the margin of the ovarian ligament through which the stitch passes in making a second circuit around the stump to avoid slipping. *c, c, c.* Angles of separation between ligatures where bleeding-points should be looked for and secured. *d.* Ovarian vessels caught in the final loop of the outer ligature.

end has been passed through the ligament by means of the aneurysm-needle, the latter is removed and the end threaded into a sharp pointed needle. By means of this it is made to transfix the ligament quite close to its edge (at *b*). It is then brought a second time through the original puncture and finally tied in the usual way. The express object in view, by transfixing in these two places, is to prevent the possibility of the outer edges of the ligament with its ovarian vessels

slipping from beneath a singly applied loop. I
have had this accident happen to me while oper-
ating, and being so impressed with the easy way
in which this smooth rounded outer edge of the
broad ligament can slip out of even a tightly
tied knot, I now always adopt the little precaution
just described, which I think absolutely ensures
against such an accident happening. Another
point to which I would draw attention is, that
in cutting through the ligament, the severance
should be beyond the apertures or spaces created
by the tightening of the ligatures. By so doing,
it renders it impossible for any one of these ligatures
to slip off. Lastly, there is always the possible
risk that a bleeding-point may be found at the
lower angle of the spaces (c, c, c) caused by the
slight tearing of the tissues in tightening the knots.
These points, therefore, should be carefully ex-
amined. Any vessels thus opened can be easily
secured.

Secondly, as regards the lymphatics. Coursing
through the broad ligaments, we have lymphatics
coming from the body and fundus of the uterus,
the ovaries and Fallopian tubes. In all cases,
therefore, where there is inflammation and suppu-
ration in one or other of these organs, there must
be septic material traversing the meshes of the
broad ligament. It requires but little reflection
to see the important bearing which this pathological
condition has upon pelvic surgery. Although we
may take every possible antiseptic precaution with
regard to our hands, instruments, patient's skin,
etc., what use is it all, if we set loose a quantity

of pathogenic microbes by the procedures we adopt within the abdomen.

The knowledge of what we may have to deal with, seems to suggest two ways at least in which we may attempt to combat, to a very considerable extent, the dangers that we must necessarily encounter.

The first precaution can only be very incompletely carried out—the attempt to render aseptic the parts from which the lymphatics arise. In ovaritis and salpingitis we can do practically nothing ; but where there are septic discharges coming from the uterus and vagina we may certainly, by douching and antiseptic packing, considerably improve the conditions of these parts. And indeed in all intra-pelvic operations we should, I think, seek to render these regions as surgically clean as possible. For though they may not be actually concerned in the origin of the mischief for which an operation is being performed, they can still become sources of infection to intra-pelvic wounds.

The second precaution is one which may be taken with a very fair prospect of success. It is the shutting off of all raw surfaces after the removal of the affected parts. Fortunately, this, as a rule, can be very effectively carried out in the pelvis, for the peritoneum lining the floor of the pelvic cavity is very lax, and can with comparative ease be stitched over the stumps of pedicles and other parts. It is more than likely, that many a fatal peritonitis has been set up in operating for suppurative salpingitis and other intra-pelvic septic conditions, by leaving exposed the raw ends of the

ligatured broad ligament. The lymphatics laden with pathogenic microbes very rapidly infect the neighbouring peritoneum, and so the mischief quickly spreads. These remarks apply with still greater force to the stump of a Fallopian tube, where the latter has been removed for some form of septic salpingitis. Dr. R. C. Coffey,* of Portland, Oregon, in operating for the condition of pyo-salpinx, has adopted a very good plan in excising the tube of making a V-shaped incision into the cornus of the uterus, so that it becomes possible, by stitching, to completely cover over and occlude its septic canal. It says a great deal for this method that Dr. Coffey is able to record sixty-five cases operated upon for pyo-salpinx without a death. He also emphasises in his paper this particular point of covering, where possible, every raw surface with peritoneum.

Cholecystostomy for the Removal of Gall-stones.—In any case where a patient suffers from what is described as another attack of gall-stones, some time after an operation for their removal, it may, with a fair degree of certainty, be taken to mean, that at the operation one or more stones were left behind. It is generally accepted that once all biliary calculi are removed no more form during the rest of life. So that if patients subsequently suffer from a return of their old symptoms, it means all the calculi were not extracted.

It is sometimes very difficult to be certain, in cases where there have been adhesions or some sacculation of, or constrictions in, the gall-bladder

* "Annals of Surgery," 1903. vol. xxxviii. p. 540.

or ducts, that every stone has been removed at the time of operating. Whenever any such doubt lingers in the mind of the operator, it is unquestionably his duty to make proper provision for their escape at any time subsequently. It has happened to me, I think, on two occasions to have stones present themselves, at or in the neighbourhood of the parietal opening into the gall-bladder, some days after the operation. In one case where at the time of operating I had removed a large number of faceted stones I thought it possible, although by no manipulative means could I feel any more, that there might be others still present. I therefore occasionally afterwards introduced the dressing-forceps to search, and it was not until the ninth morning that two faceted stones were felt just inside the biliary orifice and easily extracted.

The practical teaching is that too much haste should not be exercised in withdrawing the drainage-tube, or in allowing the biliary fistula to close. It is doubtless from want of attention to some small detail of this kind, that many an otherwise successful operation in less experienced hands has been followed by the return of symptoms—not significant of a fresh formation of gall-stones, but of stones that were inadvertently left behind at the first attempt for their removal. It is not a bad rule to make, that when several stones have been removed at the operation, to allow the gall-bladder to be drained for ten days or a fortnight, and during this period occasionally to insert the dressing-forceps for exploratory purposes.

Enterectomy for Gangrenous Intestine. Entero-Anastomosis.

Into the causes of gangrenous intestine I do not intend to enter. In some way or other it is usually due to cutting off of the blood-supply from a segment of bowel. The practical point is that we have a piece of gut, that is in much the same position as that of an extremity, which, from either external causes such as injury, or from internal causes as diseases of the blood-vessels, is dead or dying from want of proper nourishment. The simile may be carried further, for the parts in both cases become rapidly infected with saprophitic and pathogenic microbes, which are ready to invade the neighbouring tissues and so extend the process of decomposition and death. We know in the case of limbs, that if we are to succeed in preventing the extension of the gangrene, and to be certain that our flaps will not be subsequently attacked, we must amputate well above the necrotic process. To do no more than just remove the involved parts, is, in nine cases out of ten, to court failure. The same rule equally applies to the removal of gangrenous intestine. To cut through the bowel only half an inch or so beyond the line of demarcation is to run the almost certain risk of the united edges becoming attacked. It is because I believe I lost a case, solely owing to an error of judgment of this kind, that I am tempted to draw attention to such a detail in the performance of enterectomy for gangrenous intestine. A limit of at least two inches, if not more, on each side should be allowed to exist

between the line of excision and the necrotic margin.
A few inches is neither here nor there in the class
of cases for which we most frequently have to
perform this operation ; that is to say, in cases
of strangulated hernia, where at most, rarely more
than a few inches or so of gut are gangrenous.

Another practical point is worth remembering,
and that, as it concerns more especially the occur-
rence of gangrenous intestine *within* the abdomen.
We know how rapidly an offensive discharge takes
place from the surface of an external part attacked
with traumatic gangrene. There can be little doubt
that a germ-laden exudation as rapidly takes place
from a gangrenous piece of gut, and the process
occurs so speedily that there is little chance for
the formation of protective adhesions. Hence this
thin potently septic material gravitates into various
parts of the peritoneal cavity, and if we are to
succeed in effecting its total removal, it must be
by the most radical processes of intestinal exventra-
tion, and flushing with warm saline solutions.
Even supposing we cannot be sure of ridding the
periteonal cavity of all its septic contents, we may
do a good deal, in our free flushing, to dilute what
remains to such a degree of attenuation, that absorp-
tion of it may take place before any further harm
can occur.

That end-to-end union after enterectomy, is the
ideal operation for the restoration of normal
function, goes without saying ; but that it is always
the best method to employ may well be questioned.
Indeed, I doubt, from my own experience, whether
end-to-end union should not be rather the excep-

tion than the rule. But here, as in all abdominal work, the end should justify the means; and unless we feel that we are doing what is absolutely safe, we ought not to be tempted by ideals, however attractive they may appear. If I ventured to lay down a rule for end-to-end union, it would be, that *its employment should be limited to the union of divided segments of more or less equal calibre.* The least safe of all procedures is to unite a
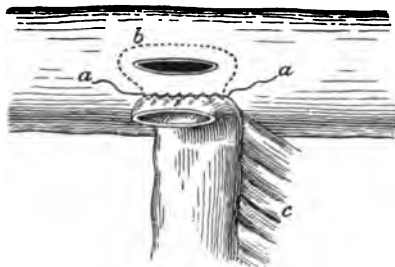
FIG. 23.—Entero-anastomosis by lateral implantation.
a, a. Ends of outer continuous Lembert suture, which, after the passage of the inner continuous Lembert uniting the margins of the intestinal orifices, is continued round the dotted line *b. c.* The mesentery.

proximally dilated segment to a distally contracted one. The safest methods of entero-anastomosis are, in my experience, those of *lateral implantation* and *lateral approximation.* No disparity of calibre interferes with the efficient execution of either one or other of these methods. In the former—that of *lateral implantation (see* Fig. 23)— the end of one segment is planted into the lateral wall of the other. It is the best method to adopt when small intestine has to be joined to large. The two approximated serous surfaces are first united by a continuous Lembert suture for half

the extent of the wall of the afferent limb. The
opening is then made in the lateral wall of the
efferent segment of an extent to equal that of the
other orifice. These two openings are then united
by a second continuous suture, and when so joined,
the outside Lembert is continued on round, and the
union completed. The one point to look to is to
see that the mesenteric margin is carefully secured
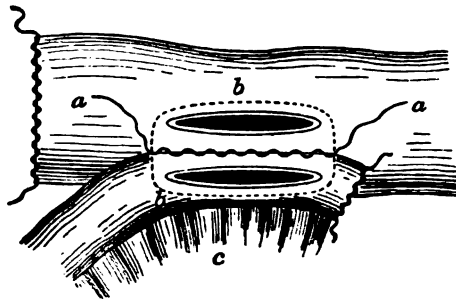
FIG. 24.—Entero-anastomosis by lateral approximation.

a, a. Ends of outer continuous Lembert suture, which, after the passage of the inner
continuous Lembert uniting the margins of the intestinal orifices, is continued round
the dotted line *b, b.* *c,* The mesentery.

and that no leakage is possible at its line of junction.
Sometimes it is found easier to perform anasto-
mosis by *lateral approximation*—that is to say,
the two ends of the divided intestine are closed,
the segments laid side by side, and a fistulous
communication established between them (*see* Fig.
24). The process of suturing resembles that em-
ployed in the previous method. It is probably
the most secure of all methods, as serous surfaces
are alone brought into contact and there is no
trouble with the mesentery, which hangs freely
from the surface opposite to that which is
sutured.

Whatever the method of anastomosis employed, success turns upon the perfect and complete co-aptation of healthy serous surfaces. All pouting projections of mucous membrane between the co-apted serous surfaces must be rigidly avoided ; and wherever the mesenteric border has to come into the line of union, the proper security of this particular spot must be carefully attended to.

The Formation of an Artificial Anus and its Closure.—However necessary the formation of a fæcal fistula or an artificial anus may be for the immediate treatment of intestinal obstruction, the particular site for effecting relief should not be lightly regarded. In some cases there is no option in the matter, for the seat of obstruction is so doubtful and so obscure, that an opening must be made in the right iliac region. Originally suggested by Nélaton, this operation still remains the best as an emergency one, for should perchance the presenting distended coil be small intestine, there is the greater likelihood of its being fairly low down in the canal, possibly the lower part of the ileum ; and should the obstruction be in some part of the colon, by opening the cæcum—if that can be secured—there is the certainty of our being on the right side of the stoppage. It must be clearly understood, that I am solely referring to cases where it is not deemed wise to open the abdomen and search for the obstruction, which we now do successfully in the majority of cases, but merely to those where immediate relief is a matter of supreme importance. But the particular object I have in view, is to show that it is not a

matter of indifference to open on the right side, when, by a more careful investigation of the case, it might have been possible for us to do so on the left. The reasons are these. Should it become subsequently necessary to close the artificial anus or fistula, it is a comparatively easy matter on the left side, but often an extremely difficult and dangerous one on the right. Further, the discomforts of an opening on the right side are incomparably greater than those connected with one on the left. Whether from an enteric, or a cæcal, anus or fistula, the discharge of fæces is almost continuous, and is semi-fluid and irritating to the skin. On the left side, however, the fæces are more or less solid, and the evacuation can frequently be regulated to an extent approaching that of natural rectal defæcation.

Another point, also worthy of consideration, is the advisability, on the one hand, of forming simply a fæcal fistula, or on the other, the establishment of a complete artificial anus. The old term " colotomy," frequently employed for opening the colon in obstruction of the large intestine in some part of its course, should, in this connection, now be abolished. It is no longer sufficiently explicit for the requirements of modern intestinal work.* The term colostomy, although etymologically quite incorrect, is the best one to apply to an opera-

* In the " Annals of Surgery," vol. xxvi., I published a paper entitled " A Plea for a Revised Nomenclature of Operations upon the Alimentary Canal," and embodied in the second edition of my " Surgery of the Alimentary Canal " a table of operations ; to these I would refer the reader for fuller reasons for some change in our present confused terminology.

tion which, in all its essential practical details of execution, resembles that of gastrostomy or œsophagostomy. The making of an artificial anus should be limited to an operation that involves the immediate discharge of all the bowel-contents. In other words, a colostomy signifies a fistula in which only a *portion* of the bowel-contents *need* escape, while an artificial anus indicates an opening through which *all* the bowel-contents *must* be discharged. As regards the simple question of giving immediate relief, either operation sufficiently serves the purpose ; but the more remote consideration of having to deal with the opening at some future period, is a matter which does not often receive the attention it should. The lines upon which we should act are the following : if we have reason to believe that subsequent closure of the artificial opening will be necessary, we should perform colostomy ; if, on the other hand—as, for instance, in obstruction due to inoperable carcinoma of the rectum—we know that a permanent aperture will be necessary, we should make an artificial anus by simply bringing out a loop of sigmoid or descending colon, and opening and securing it by one or other known method.

Any who have had to attempt the closure of a cæcal anus or fistula, will appreciate much that I have said above, and will consider none of the advice I have ventured to give unworthy of regard. I do not think I express myself too strongly, when I say, that the closure of a cæcal anus may constitute one of the most difficult operations in intestinal surgery. I do not wish to unduly

exaggerate what may perhaps be due more to my own personal feelings; but to have spent two hours over an operation of this kind, and then lose my patient, was a fact in itself to produce a profound impression. The difficulties were enormous, and yet the formation of the anus, some four months previously, for a condition of chronic mucous colitis, was the simplest possible procedure. Were this the only case in which I have encountered difficulties, I should not, perhaps, have been warranted in making so much of it; but my experience in more recent cases has been to show, that the difficulties in this particular instance are by no means exceptional. They arise from this cause. That, apart altogether from the union of the edges of the intestinal orifice to the edges of the abdominal wound, quite extensive adhesions seem to take place between other coils of intestine, both large and small, and the particular coil which possesses the fæcal aperture. So that when we begin to detach the bowel-edges from the skin, and try, by increasing sufficiently the abdominal incision, in order to free the involved piece of bowel, we find any amount of matting between neighbouring segments of gut. Thus, what we most need, indeed almost necessarily require, the free healthy serous coat for doubling in and occluding our orifice, we cannot obtain. An effort of this kind need not necessarily fail, but, I believe, it entails great risks, and judging by my own experience and that recorded by others, it is a procedure not to be undertaken without a grave sense of the responsibility it entails.

Fortunately, we have, I think, a way of partially escaping from the many difficulties connected with the operation as described above. First, we may adopt the old plan, and a very safe and good one it is, of destroying the spur that exists— or is made to exist at the first operation—by the use of Dupuytren's or Nélaton's enterotome. The latter I prefer, and have used it with success. But even with this, it is sometimes impossible to sufficiently establish a continuity of the canal, so that no leakage takes place through the old opening.

The only really effectual remedy is, I believe, the performance of entero-anastamosis. Although in one sense it seems like submitting the patient to a second severe operation, it is in the end the safest and most certain remedy. The abdomen is opened on the left side by a curvilinear incision in the iliac region (*see* Fig. 13, p. 233), the sigmoid is sought for and withdrawn, while the ileum is traced to the cæcum, and then severed at a convenient distance from the latter; the distal end is closed, and the proximal planted into the lateral wall of the sigmoid (*see* Fig. 23, p. 271). Thus the contents of the ileum are now discharged into the sigmoid; and except that occasionally a little regurgitation takes place and some fæcal matter escapes from the old orifice, the latter rapidly begins to contract, and a very little paring of its edges suffices to bring about closure. I may say that I have not found that the emptying of the ileum into the sigmoid has materially interfered with the normal evacuation of solid and well-formed fæces; although there is sometimes a

tendency to more frequent defæcation and attacks of diarrhœa. Added interest is given to this particular form of entero-anastomosis by the remarks of Sir William Macewen * in his " Huxley Oration," in which he claimed that the cæcum and appendix performed important parts in the process of digestion. Whether this be so or not, it hardly affects the question in the present connection, for we do not *remove* these regions; and we are adopting not merely an expedient measure, but a necessary one. If, however, the cæcum and appendix really possess the important functions Sir William attaches to them, the ultimate results of this method should be carefully watched; and attention more particularly directed to the character of the fæces to see how far they are affected by being deprived of the digestive secretions of these particular parts.

* *Brit. Med. Journal,* 1904, vol. ii. p. 873.

CHAPTER XIX

THE AFTER-TREATMENT OF ABDOMINAL OPERATIONS

REPAIR goes with Rest is a good maxim to re-
member in abdominal surgery, and it behoves
us to do our best, to ensure that it is practised
to its utmost extent. It is a common enough
observation in general surgery, that the wound
which heals quickest and best, is the one in which
nature exercises its reparative powers unimpeded
by any extraneous or abnormal influences. It is
never what we *put to* a wound that makes it heal ;
it is what we *keep from* it. And the more, also,
we can restrain even the normal functions of the
part wounded, the better the lesion seems to like
it. It appears strange, and yet it is perfectly true,
that sleep, which tends to calm and slacken most
physiological processes, entails the greatest activity
in the process of repair. How often has it
happened, that anxieties felt at night, have been
dispersed in the morning by the results of a few
hours' quietness and sleep. So trite and common-
place may all this seem, that merely to mention it
is to waste words and time ; and yet I do not
think this question of rest has its due share of
recognition in the after-treatment of abdominal
operations. It is not only that we want immediate

repair, but we want also perfectly secure and permanent union : we want a wound that will be as sound when healed, as the very tissue through which it was originally made. It is no very flattering compliment to our work, if our patient subsequently returns to us suffering, not from the effects, it may be, of the original disease, but from the treatment we adopted for its remedy. Let me, however, explain in detail more fully what I mean ; and first as to the general after-treatment to be adopted in all cases. And here I must again remark, that I am only selecting certain points, such as have appealed to me as requisite for the attainment of the results most desired.

It is rarely, except under special circumstances, that an abdominal operation is performed anywhere else than in a. public hospital or a private nursing home. One reason is the existence in each institution of a properly equipped operating-room ; and another, of scarcely less importance, the isolation of the patient in a separate room after operation, to which only those in attendance are admitted. It is this latter reason to which I am accustomed to attach no little weight. To place my patient under circumstances which afford the best possible conditions for quietness and sleep, is what I most eagerly seek for within the first twenty-four or forty-eight hours after the operation. It is within that period that the most important initial processes of repair take place. The peritoneal surfaces will become almost firmly glued together within twelve hours. While, therefore, seeking to remove, as far as possible, all external

sources of disturbance, I do not hesitate to ad-
minister a half-grain morphia suppository or a
sixth of a grain hypodermically, to be repeated, if
necessary, later, in all cases where there are not
other circumstances present to forbid the use of
the drug. In my hospital work I have rooms set
apart for my abdominal cases ; into these they
are placed on returning from the operating theatre.
With the aid of well-trained nurses, these patients
are carefully attended to for the first few days,
at the end of which time, they can be safely trans-
ferred to the general ward.

How long do you keep your patients in the
recumbent position after an abdominal operation
is a question frequently asked. Four weeks I
believe to be a reasonable period, shortened only
in exceptional circumstances, and not infrequently
extended. I have always failed to understand
what credit was to be attached, or what advantage
to be gained, in feeding by the mouth a gastric
or intestinal case a few hours after operation;
or in allowing a patient to rise after a fortnight's
or three weeks' rest, because the stitches were
removed and the skin-edges healed. It is im-
possible to believe that the new line of union in
either case is so well and completely organised,
that no giving of the cicatrix can or will take place.
And when we regard how trivial is the consideration
of a week or two added to the patient's treatment—
often in cases where there have been months or
years of previous suffering—as compared with
the risks of too great freedom and too early per-
mission to exercise it; I say, when we make this

comparison, is it worth while to allow a patient
to return so quickly to the normal functions of
life, for the sake often of a little personal kudos,
which some seem to think is attached to such
procedures ? I have heard it related of the late
John Hilton, the author of that classical book, " On
Rest and Pain," that when discussing the result
of an injury to the head, he is reported to have
said, that if ever he suffered from concussion, he
would do his best to give his brain rest for six
months afterwards, in order to avoid the possi-
bility of too early exercise of the organ leading
to subsequent softening. The principle enunciated
was undoubtedly good, although the practical exe-
cution of it may appear to some unduly exaggerated.
Yet I would apply it to all abdominal work and
prefer to err on the side of keeping my patients
too long under the various conditions of rest than
court the risks attendant upon a practice of too
much haste. If from any cause a wound does not,
or cannot, from the circumstances of the operation,
unite by primary union, six or even eight weeks
should not be considered too long to maintain the
patient in the recumbent position. It is in wounds
which heal by granulation, that subsequent ventral
hernia is to be most feared. And our aim should
be to wait until the newly formed cicatricial
tissue has become so organised, that further stretch-
ing of the wound will not be possible under the
normal strains of active life.

**After-treatment in Cases of Gastro-jejunos-
tomy.**—So frequently is this operation now per-
formed, and so varied is the subsequent treatment

adopted, that a few remarks may not be out of place, on the latter point, by one who has now had an uninterrupted series of twenty-eight successful cases. The operation, with but few exceptions adopted for special reasons, is a posterior gastro-jejunostomy performed by suturing, and with the opening made close to the greater curvature. As soon as the patient recovers from the shock of the operation, and the pulse has regained its full force, the patient's bed is raised at the head by two eighteen-inch blocks placed one under each leg. The object I have in view in thus elevating the patient into a steep inclined plane, is to cause gravitation of the swallowed saliva and the gastric secretion, through the now dependent opening into the jejunum. Thus I hope to lessen the possibility of any contraction of the gastric parietes, and so afford as much rest as possible to the artificial orifice. Towards the same end, no nourishment is given by the mouth for the first four days : all feeding is by rectal enemata. The exceptions to this practice are in those cases, where, from extreme inanition the result of advanced disease, nourishment must be commenced by the mouth as soon as possible; and whatever the risks attendant upon giving food a few hours, it may be, after the operation, these must be run in the face of the greater risk of losing the patient from sheer exhaustion. On the other hand, when the operation has been performed for gastric ulcer with possibly hæmorrhage, for chronic gastric catarrh, or other chronic affection not necessarily of a pyloric obstructive nature, rectal feeding may be continued

with advantage for several days—in some of my cases nothing has been given by the mouth for two weeks. In these cases the object is not so much for the sake of the gastric wound, as for giving complete rest to the stomach, and thereby a chance of repair to the lesion with which it may be affected.

This elevated position is usually maintained for the customary period of four weeks, during which the patient is kept recumbent ; and a reason for so doing is that the bile flowing down the proximal limb of the attached jejunal loop may, with greater facility, pass on into the distal limb ; and with the greater tendency of the gastric contents to gravitate into the bowel, prevent any possibility of bile being pumped or sucked into the stomach. I may add, the patient gets to like the position, and though offered sometimes the alternative of reclining in the horizontal, prefers to be kept in the inclined.

Usually at the end of the fourth day, in cases where the operation has been performed for obstructive pyloric disease, feeding is commenced by the mouth. A few tablespoonfuls of hot water are administered as a preliminary test, succeeded by peptonised milk and a course of diet in accordance with a scheme I have constructed for the purpose.

After-treatment of Cases of Operation upon the Female Pelvic Organs.—There are only three points that I wish to refer to in this connection, and they concern the three pelvic outlets. The most important of these is the vagina. No matter whether we have simply removed an ovary for

chronic interstitial ovaritis, or the uterus and appendages in a pan-hysterectomy, the proper cleansing and sterilising of the vagina after the operation is a matter of no little concern. For all that the deep parts are likely to be affected, we might with greater safety leave our external parietal wound unprotected than the vaginal canal unattended to. For if subsequent infection of the intra-pelvic wound takes place, it will with infinitely greater likelihood occur through the lymphatics coming from the vagina—and uterine cavity if the uterus has been left—than from any other source, exclusive of that introduced at the operation. With still greater force is the danger increased when we actually have a vaginal wound such as exists after a pan-hysterectomy. This deep-seated external wound—for it is external—needs protection and attention every bit as much as, indeed if not more than, the abdominal incision through which we have performed our operation.

To meet, therefore, the possible contingencies connected with any likely septic condition of the cavities of the vagina and uterus after pelvic operations, the methods for cleansing these parts used before operation are as assiduously continued afterwards. Hot douches of 1 in 40 carbolic lotion are employed night and morning, and in the intervals between this cleansing, the vagina is gently plugged with iodoform gauze in order to absorb any discharge that may come from the mucous surfaces.

The second point concerns the urine. With the patient in the dorsal recumbent position, normal micturition is often difficult, and even where possible

not altogether free from danger. For the iodoform gauze plug used to protect the vaginal surfaces, might, by becoming soiled with urine, prove the direct means of contaminating them. To avoid this, therefore, it is wise, for the first few days, to withdraw the urine four-hourly, or as often as required, with a glass catheter.

The third point refers to the rectum. Although it is the custom prior to the operation to get the bowels well emptied, it is, I think, equally advisable that no stagnation of fæces should ever be allowed to take place after. It must happen in some cases that more or less inflammatory activity exists around the parts operated upon, and when this embraces the peritoneal lining of the upper part of the rectum, there is a risk that some infection may take place by the wandering of microbes through the rectal wall, owing to its normal pro-tective lining being temporarily damaged. The object, therefore, should be to place the contents of the rectum, or better the internal lining-wall of the canal, into as microbe-free a condition as possible, either by obtaining a fairly free and fre-quent evacuation with aperients, or by occasional warm water injections. Probably the best con-dition to maintain the -bowels in, is one of empti-ness.

The Value of Rectal Feeding.—When writing my Treatise on the "Surgery of the Alimentary Canal," I devoted the concluding chapter of the book to the administration of rectal enemata. It was picked out by some of my Reviewers as a useful chapter on the subject. It is now ten years since

I wrote it, and if I were to judge it on the practical experience I have gained since then, I should condemn it as useless. That absorption takes place in the rectum and colon no one doubts, but that all the materials in the way of nutrient enemata which have, from time to time, been put into it are taken into the system for the purpose of bodily nourishment, many will be ready to question. Would indeed that the rectum could do for us what alone seems to be the prerogative of the stomach, and more particularly of the small intestine. But prepare our enemata as we may, with pancreatine, pepsine, ox bile, or any other digestive, our patients would soon die of starvation, though the rectum and colon be loaded to their utmost limits. What I always found in using many of these more or less complicated mixtures was, that if they were not naturally ejected, they invariably had to be removed by copious fluid enemata once in twenty-four hours. This did not necessarily imply that they had not subserved some nutritive purpose during the time they had been retained within the canal, but the bulk of solids removed so often seemed only a little less than that introduced, that it was doubtful if any real good was being effected.

So far as I have been able to judge, the conditions requisite for absorption through the coats of the large intestine and rectum, are a fluid of specific gravity equal to that of so-called normal saline solution, and one of the body temperature. If these conditions are fulfilled, then there is practically no residue left after an injection. That certain materials, capable either of solution or of being

taken up in very fine division, are absorbed, there can be little doubt; and it would even seem that fats, when in the form of fine division or emulsion, can also be taken into the system. For how could we otherwise explain the effects of a. half-grain morphia suppository, where the drug is diffused through a solid fatty mass.

I feel, therefore, that as there are many facts still difficult to explain in the matter of rectal and colon absorption, one must not speak too dogmatically. Practical experience, however, must always take precedence of theory, and I own to have been better satisfied with a very simple form of nutrient enema, than with any apparently much more nutritious ones, which I was, at one time, in the habit of employing.

The one practice now adopted in all cases in which I wish to withhold nourishment by the mouth, is the four-hourly injection of a solution which comprises four ounces of peptonised milk and two ounces of saline solution (one teaspoonful of salt to the pint of water) raised to a temperature of about 100° Fahr. Since this simple form of nutrient injection has been employed, my nurses tell me that the enemas are but rarely returned, and when a rectal wash-out is given, little or nothing comes away. Additions are made to this as required. Sometimes for the sake of stimulating the patient, a tablespoonful of brandy is added ; and sometimes a few drops—10 or so—of laudanum are introduced for sedative purposes. In all cases the introduction of the enema is effected *slowly* and *intermittently* by means of a gum-elastic catheter (No. 9 or 10 urethral) attached to a

rubber tube. To the other end of the tube an ordinary glass-filler is affixed, and this is held about a couple of feet above the bed, so that gravitation alone effects the passage of the fluid into the bowel. By this same means, also, a pint of saline solution may be occasionally introduced to allay thirst, and to clear possibly the lacteal channels for the better absorption of the more nutritious milk constituent of the enema. In some of my gastric cases—those operated upon for gastric ulcer or hæmorrhage—the patient has seemed almost to thrive on a fortnight's rectal feeding by this simple saline-milk solution. There are some, I know, who will be willing to go farther than I have done, and say that patients will even do well on no other injection than that of water, ignoring all nutritious ingredients. I am inclined, too, to believe it; but the introduction of milk is a sort of salve to my own conscience, and is certainly also a frequent source of satisfaction to the patients for they know and feel that they are being fed, although from the wrong end !

Results of Abdominal Operations.—It will form a fitting conclusion to these few practical remarks that I have made on the performance of abdominal operations and the after-treatment of the cases, to give a few statistics connected with my work. The only true test of any method is not the amount of reasoning that may be brought forward in support of it, but the practical result of its employment. A plan may appear to be as reasonable as is possible, but if it only ends in failure not much can be said in its favour in a practical department

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of our profession like surgery. Nature is much too complex and mysterious in all its bearings to admit of being gauged by the narrow limits of human reason. We may adopt many empirical measures and succeed, just because our powers of reasoning penetration are so superficial. So that in all that we do in surgery, the true criterion by which to judge of the success of any particular method is solely the result attained. But there is just one mitigating factor in accepting this judgment too sweepingly, and so great may this be that it must ever be remembered. It is that because one success follows on the adoption of a certain practice that therefore it must be the right course to pursue on all occasions. The error is too plain to need further amplification. It must always be the exception that proves the rule in our work. Our plan must be accompanied by success in the large majority of the cases in which it is employed, and when failure does ensue, it must be shown to be due to other causes which we have perchance failed to recognise and properly consider.

If then any methods that have seemed to me reasonable to employ have been followed by a succession of good results, I have not done wrong in venturing to put them forward; and in doing so it has not been that I have necessarily regarded them better than those employed by others, but that in my own individual work I have found them good to execute; and that they have afforded me the success which I, like all men, strive to attain.

In attempting to gauge the merits of any particular method, one has to guard against the possible

error of attributing to that particular method more than rightly belongs to it. So many are the details to be attended to in the attainment of success, that the failure duly to regard any one of these may upset all the well-planned intentions for the carrying out of a special scheme. Important, therefore, as any adopted method may be, it must only be considered as one link in a chain of many that lead to the desired result.

In the results which I intend to give, I shall only select a few classes of cases representing fairly distinct and separate regions of the abdomen; but before doing so I will speak, first, of the results of the method of preparing the abdomen with the lanoline-oleate of mercury prior to operation, and secondly, of the results of the transverse and curvilinear incisions in opening the abdominal cavity.

As regards, first, the **Results of Mercurial Inunction.** Since commencing to employ this method nearly three years ago, I have used it in the preparation of every abdomen in which it was possible to obtain the two days necessary for its application. The Sisters of my male and female wards at first kept careful notes of every case in which the skin was so prepared. This has, however, for some time been given up. Unable, therefore, to give numbers, I have to fall back on impressions. I cannot myself recall a case, where the abdominal wall has been efficiently prepared, that has not healed by primary union. Appealing to my two Sisters, they express the same opinion. In every case where we have been troubled by the wound suppurating, there has been a distinct cause, either

the operation was one of emergency, where the skin could only be prepared by the ordinary cleansing methods, or there has been some deep-seated septic mischief which has unpreventably led to the infection of the wound during operation.

As regards the **Results** of the **Transverse** and **Curvilinear Incisions,** I am only able to speak positively of the immediate results ; for I fully own that a practice which has not been adopted for more than three years, and in most cases for a much shorter period, does not admit of an equally positive statement as regards remote results. Concerning immediate results, nothing could be better than the way in which these wounds heal. On the tenth day, as a rule, the stitches are removed, and the wound to all visible appearances is soundly healed. I have not the slightest doubt in my own mind of the incomparably superior process of repair which takes place in these incisions as compared with the vertical, and more particularly the median vertical. If a wound heals quickly and soundly we have very good reason to believe that it will form a secure, non-giving cicatrix. However, reasons are not sufficient in cases of this kind, and the only true test is that of time. For what one or two years' experience may be worth, I may say that I have not yet seen a single instance where one of these high up cicatrices has given ; and this has been in many cases where the rectus muscle has been divided. As I shall indicate below, in twenty-eight consecutive gastro-jejunostomies involving partial division of both recti, every cicatrix known to me has been a perfectly sound, non-

giving one. However I give my advice and opinion guardedly in this matter; for the method to receive unqualified commendation, it must stand the test of a large series of all kinds of cases, high division as well as low division of the muscles, extending over a period of several years.

The **Results** of the **Operation of Gastro-Jejunostomy.**—Within the last eighteen months I have operated upon an unbroken series of twenty-eight cases of non-malignant disease of the stomach, by performing gastro-jejunostomy, without a fatal result. It would be entirely beyond the limits of what I wish to say to enter into the various conditions for which this operation was performed— they were mostly cases of organic obstruction at the pylorus—or to discuss the results. The simple object I have in view is to show the safety of the operation itself when executed with all proper precautions, and by the adoption of some of the methods above described. In every case the oblique abdominal incision was employed, and entailed the division of a few fibres of the right rectus muscle and about half those of the left; yet in not a single instance, that I know of, has a weak abdominal cicatrix been left.

The **Results** of **Removal** of **Gall-stones** from the **Gall-bladder and Ducts.**—Out of a consecutive series of twenty cases in which stones were re-moved either from the gall-bladder, cystic duct, or common duct, I lost two patients, one from internal hæmorrhage, the other from cardiac failure. The accident in the first case was unexpected, and somewhat remarkable. The gall-bladder was

shrunken and contained viscid fluid. To guard against any possible infection of the general peritoneal cavity from inability to bring up the gall-bladder to the parietes, I stitched the omentum to the lower part of the abdominal wound. Nothing was noticed at the time in the way of bleeding. The patient did well at first, but subsequently began to get restless on the third night after withdrawal of the stuffing around the tube at the day dressing; and growing paler and the pulse feebler, died on the fourth day. At the post-mortem the pelvic cavity was found filled with blood, and blood could be traced up the right side to the omentum. Although the actual puncture was not discovered, the explanation of the bleeding seemed to point to the stitch perforation of a small omental vessel, which, from the peculiar non-coaguable condition of the blood in jaundiced cases, had gone on oozing until death resulted from internal hæmorrhage. The death in the second case is equally worthy of being noted. The patient was a woman aged forty-five years, enormously stout. She had had attacks of acute epigastric pain off and on for six years, and the most recent one had left her deeply jaundiced. Her urine contained a quantity of albumen. At the operation, the liver was greatly enlarged, and the gall-bladder, though distended, was contracted and hidden beneath the overhanging hepatic lobe. More than a pint of clear viscid fluid was first aspirated. No stones existed in the gall-bladder, but a number of comparatively large faceted ones blocked the proximal part of the cystic duct, and the whole common duct.

It was possible by external manipulation to work a number of the stones back into the gall-bladder, and so remove them ; but as others still remained impacted in the common duct this had to be opened and their removal effected in this way. A large stone jammed in the ampulla of Vater refused to budge, and had to be removed by opening the duodenum. The operation was consequently an exceptionally tedious one, and, from the stoutness of the patient, difficult. However, all went well for the first four days, and there seemed no reason to doubt the patient's ultimate recovery. Bile drained from the tubes placed in the gall-bladder and common duct ; the patient was free from pain and passed flatus, took milk, and did not vomit. However, on the morning of the fifth day she suddenly became much worse, manifesting no special symptoms beyond rapidly increasing exhaustion, aud died apparently from heart failure. No post-mortem was allowed, so that the real cause of death was unascertainable, but from the quantity of albumen present in the urine it is probable that the kidneys had something to do with the fatal result. I have given the case in full, as I think it shows how extremely difficult some cases may occasionally prove; and that it is hardly fair to class a complicated case of cholecystostomy, choledochotomy, and duodenotomy with the simpler and more frequently executed cases of only cholecystostomy.

Results of **Operations** upon the **Female Pelvic Organs through the Abdomen.**—Out of a consecutive series of thirty-one operations within the last eighteen months, I have had four deaths.

Two of these were panhysterectomies for advanced uterine carcinoma, where it would probably have been wiser not to have attempted removal; one was a ' Poro,' in which, at the post-mortem on the following day, a double suppurative pyelitis was found ; and the fourth a large suppurating ovarian cyst, which ruptured in separating the adhesions, and led to death on the fifth day, from, I think, peritonitis, although the symptoms both before and after operation were more suggestive of septicæmia. The employment of the curvilinear incision through the abdominal parietes gave, in the cases of large uterine myomata, good access to the lateral regions of the pelvic fossæ: expedited ligature of the broad ligament and uterine vessels ; and, I am disposed to think, lessened the chances of hæmorrhage. The incisions healed well.

Results of the **Operation** of **Appendicectomy.** —During the same period of eighteen months I have removed the appendix in forty-three cases, with five deaths. Four out of these five, were cases of gangrenous appendicitis with general peritonitis, and the remaining one, the same condition but with no peritonitis. It will, of course, be understood that no statistics concerning operations for appendicitis are of the least value, unless a very careful analysis and proper classification is made of the cases included. It would clearly be an unjust indictment of the operation, to say that the percentage mortality of appendicectomy in my list of cases was 11.6 ; such a statement would convey quite a wrong estimate of the safety or dangers of the operation. A really much truer and juster

inference could and would be drawn by excluding these almost necessarily fatal cases, and saying that when the appendix is removed under less extreme conditions the operation is almost always successful. It unfortunately too frequently happens, to the discrediting of our efforts, that patients dying *after* an operation performed to save life are reckoned as deaths *from* the operation. It would almost be equally as just to say, that patients, dying any time after the administration of a dose of physic given to save and prolong life, died from it. The cases are perhaps not quite parallel, because the operation could kill, while the drug in all probability could not. But there are occasions, and many too, where the operation deserves as little to be blamed for the fatal result as the dose of medicine. I do not think one of my five fatal cases could have lived even supposing no operation had been performed ; there were, however, in the series several where death must have inevitably occurred had nothing been done. The true inference to be drawn is, that the operation of appendicectomy is, in itself, a perfectly safe one : that when employed on occasions of necessity it may not always succeed, but when adopted solely as a measure of expediency it should never fail.

In these last few words is contained a fitting ideal to be striven for in all abdominal surgery ; and I would, in conclusion, repeat the hope, that the time may not be far distant when our methods may be so perfected, that in operations of expediency we may always succeed, while in those of necessity we may but rarely fail.

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